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CONTENTS

EDITORIAL:

When Are Rates Reasonable?.....	649
Free Transportation Under Rate Law.....	649
How to Make Good Machinists.....	650
The Future of Railroad Investment.....	650
State Railroads.....	651
New Publications.....	652

ILLUSTRATED:

The Smyth Camp Embankment: C. M. & St. P.....	656
Atchafalaya Bridge of the Southern Pacific.....	661
Pneumatic Caissons.....	671
Egmore Station, Madras; South Indian Railway.....	678
The New York, Philadelphia & Norfolk.....	681

LETTERS TO THE EDITOR:

The Problem of Handling "Astray" Freight.....	653
Reasonable Rates.....	653
A Solution of Mr. Nichols' Problem.....	655

MISCELLANEOUS:

Joint Interchange and Inspection Bureaus.....	658
Indiana Commission on Causes and Remedies for Railroad Accidents.....	663
Five Years of Railroad Regulation by the States.....	665
Siberian Railroad.....	670
Causes and Sources of Claims.....	683
Foreign Railroad Notes.....	664, 677, 683
Continuous Brakes in Europe.....	661

GENERAL NEWS SECTION:

General News.....	684
Traffic News.....	686
Equipment and Supplies.....	690
Railroad Officers.....	692
Railroad Construction.....	692
Railroad Financial News.....	694

The thesis on the subject of reasonable rates, which Dean Raymond contributes this week in the form of a letter to the editor, is worthy of careful consideration. The subject is one of extraordinary difficulty. No real student of transportation thinks any longer that the capitalization of a railroad has any important connection with its rates, and it is universally admitted that the natural process of charging what the traffic will bear (and no more) is fundamental in rate making. Dr. Raymond brings this out with great clearness, but he also calls attention to two correlated facts usually overlooked—that people cannot always tell just what certain kinds of traffic will bear, and that on some articles of high value and limited supply, such as diamonds, nobody tries, in practice, to exact the last possible farthing on the transportation charge, but an equitable rate is guessed at, the theory being that this

rate should pay the transportation company a share in the total profits proportionate to the transportation company's share in the total effort of production and sale. Carrying out these principles, Dr. Raymond shows the fallacy of the national doctrine of enforced competition, and argues that competition is an imperfect regulator and a costly one. He holds that the governmental police power should be applied both to existing and to proposed lines, but that railroads should be allowed and encouraged to pay to their owners larger returns on money invested than they now can do. He would divide railroad capital as closely as possible into three classes: bonds, representing the debt incurred in building the road; preferred stock, representing money invested by the owners, as distinguished from the debt creditors, and common stock, representing ownership of good will and other intangible values which grow out of usefulness to the community, and are properly entitled to the profits if any profits are created. Preferred stock (really a species of income bond) is to be given, dollar for dollar, for all improvements made from income, and the owners of the property are thus to have their "equities" recorded in black and white. The securities plan is open to some rather serious objections, one being that the constant increase in the share capital would inevitably be looked upon with alarm by existing shareholders, and managements would hesitate to undertake important betterment work unless it promised immediate return. But the value of Dr. Raymond's letter lies not so much in the details, several of which seem to us debatable, as in its clear insight into the fact that the theory and practice of American railroad regulation is confused; the regulators are worshipping false economic gods, and are particularly forgetful of the fact that large profits in themselves give no indication of exorbitant rates.

The indictment of the Illinois Central and the Chicago, Rock Island & Pacific at Chicago for having issued annual passes to caretakers of fruit, raises some interesting questions as to the construction to be placed on the free transportation provision of the Hepburn act. The law provides that free transportation may be issued to certain specified classes of persons, including "necessary caretakers of live stock, poultry and fruit." Nowhere does it specify what kind of transportation may be issued or how or when it may be issued. Clearly it did not intend that free transportation should be used by caretakers of fruit, except when acting in their capacity of caretakers. The Illinois Central and Rock Island recognized this fact, and in each instance took from the shippers to whose employees annual passes were issued contracts stipulating the purposes for which the passes were to be used, and providing that they should not be used for any other purposes. Annual passes were issued, it is stated, by officers of the railroads, to obviate the inconvenience, delay, and, often, impracticability, of procuring and issuing trip passes due to frequent changes in the routing of shipments of fruit and to other causes. But the Interstate Commerce Commission and the Department of Justice contend that it was illegal to issue anything but trip passes. That is, they ask the courts to read into the law what is not there. If only trip passes may be issued to caretakers of fruit, then to what classes of persons must annual passes be confined? It appears that the violation of the law must consist in the misuse of the transportation, no matter what kind of transportation it may be, since the law does not specify what kind of transportation may be issued. We do not understand that there is any evidence that the passes in question were used otherwise than as stipulated in the contracts. But even if they were, would that make the railroad, which has sought to guard against their misuse, guilty of a violation of the law? If so, every person who lawfully has transportation may subject the railroad to the penalties of the act by surreptitiously loaning it to somebody else. Every person having an intra-state pass bearing the warning stamped across its

face that it must not be used for an interstate trip, may involve the railroad in guilt by disregarding this warning. Where there is so much doubt as to the meaning of the law, and where the carriers seem to have taken care to keep within its limits, it seems that it would be fairer to seek an interpretation of the statute by a proceeding in a court of equity than through the drastic and sensational method of indictment. Under present conditions, as soon as a railroad is indicted, it is at once convicted in the court of public opinion, whatever may be the final result in the courts of law.

HOW TO MAKE GOOD MACHINISTS.

No one who reads and considers the recent statement* of James O'Connell, President of the International Association of Machinists, ought to misunderstand the attitude of the old-line, skilled mechanics toward young men who have passed through the apprentice school. The idea of increasing the usefulness of public high schools by incorporating manual training work has a tendency to lead many people, especially graduates who have a desire to enter the mechanic's calling without serving an apprenticeship, to think that their high school training has equipped them to seek employments as mechanics. This tendency is not unnatural. It is a prevalent joke in a railroad shop that the apprentice learns more in the first six months of his time than during the entire following three and one-half years. In shop parlance, a youth knows it all after the first six months. At the end of two years he is not so sure about it, and when he nears the end of the four years and is thinking of leaving his home shop [when this is necessary to obtain a full machinist's rating], he realizes that he is not the mechanic he would like to be. The explanation for this seems to be that in going into the shop for the first time the graduate enters an atmosphere entirely new to him. During the first six months he really picks up a goodly store of knowledge and becomes so familiar with the shop in general that he thinks there is little left to be learned. This misunderstanding is corrected as he grows older at the trade. Old, gray-haired mechanics have been heard to caution an apprentice about saying that he had learned the trade. A man with the highest respect for his calling prefers to say only that he has served an apprenticeship.

Mr. O'Connell dispels the apprehension as to the old mechanic's attitude towards young men, who in the present day have opportunities which he himself, as well as the thousands of men whom he represents, never had. He expresses the belief that industrial education in trade schools should be so directed that young men will not be encouraged to think that, after serving a few months, they can secure certificates which will warrant them in going into the industrial field seeking employment as mechanics, in competition with those who have served a reasonable and legal apprenticeship. To avoid this danger and to secure the highest skill and perpetuate the supremacy of the American mechanic, Mr. O'Connell believes that employers should establish schools in connection with their factories and workshops, and give young men employed by them an opportunity for a few hours' schooling each day in addition to the practical experience they are securing while serving their time as apprentices. He expresses the opinion that this is best done by the New York Central Lines, under the supervision of Mr. Deems.

The day of putting an apprentice in the shop and allowing him to get the most or least out of it may be well considered as past. There was undoubtedly one good feature in this plan. The apprentice who was determined to make a good mechanic realized his opportunities and made the best of a bad condition, while the others did not last long. At present, however, a railroad does not want even to start with a boy who is not going to be a good mechanic. The idea now is that the apprentice of the present is a motive power official

of the future on the road of his home shop; not that he must look forward to leaving it to obtain his full machinist rating. This idea was what the Master Mechanics' apprenticeship committee had in mind when it outlined its first principle as follows: "To develop from the ranks, in the shortest possible time, carefully selected young men for the purpose of supplying leading workmen for future needs, with the expectation that those capable of advancement will reveal their ability and take the places in the organization for which they are qualified." Further recommendations by the committee which will work to the betterment of all concerned in the apprenticeship question deal with the necessity of team-play throughout the entire system, beginning with the management; the importance of placing a competent person with adequate authority in charge of the entire apprenticeship plan; the preliminary acceptance of apprentices after a careful examination; the probationary period before their final acceptance, and the keeping of suitable records of the work and standings of the apprentices.

THE FUTURE OF RAILROAD INVESTMENT.

The records indicate that during the first half of the present calendar year not less than \$175,000,000 in railroad shares and some \$650,000,000 of new railroad securities in the form of bonds and debenture obligations have either been put upon the market or prepared for early date. How large a proportion has been actually placed cannot of course be stated. Some of the issues remain still in the hands of underwriters. Some of them have been issued for refunding and cannot therefore be charged up as new capitalization; and some of them still remain unsold in the treasuries of the railroad corporations. The issues range all the way from the successful first mortgage loan of the Pennsylvania and the convertible debenture loan of the New Haven to other issues of other corporations that have fallen flat. Still, at a rough estimate, probably three-quarters of the great total of \$825,000,000, or say roundly \$600,000,000, have in one form or another been placed; and this rough estimate makes no allowance for short loans of the railroad corporations of a non-public nature. Borrowings of the latter character while obscure in amount must have been large and, as they must be liquidated sooner or later, they fall into the limbo of new railroad capitalization. The fact that the bond and note issues are nearly three times the stock issues will be noted.

The stalwart figures have their seeming anomalies. They present themselves during a period of acute traffic depression. Theoretically it is prosperity rather than adversity that generates large capitalization; but here the reverse has come to pass. In a general way it may also be said that prosperity periods have also been "bond periods." The opportunity of the higher class of railroad corporations to market bonds at a low interest rate has, on the whole, been more attractive than borrowing money—in a sense—from the stockholder at a higher dividend rate. But our adversity period, for a different and, indeed, reversed cause, has stimulated the "bond" policy. Bonds and notes, both senior to stock, have had to be negotiated rather than stocks in a timid investment market. Nor is the apparent anomaly of great security issues during traffic depression really such. That depression came suddenly at a time of high railroad expansion. It caught the railroads at a time of active construction and increasing equipment with many contracts outstanding, not a few of which had to be fulfilled. It has been for the railroads a costly business with the interest rate on securities high, but, spite of much curtailment of play for expansion, the residuum calling for new issues under imperative conditions has been great as the figures prove. Much of the new construction was of such a nature that it could not be halted half way. The railroads, in both a physical and fiscal way, have been

*From an address to the Civic Federation of New England.

forced to expand at a time when they have wanted to "stand pat" if not to contract.

How long such a condition of railroad affairs is to continue cannot be predicted. It rests upon many contingencies. It may be that the immediate necessities of the railroads, on any large scale, for new funds have nearly or quite been exhausted. It may be, on the other hand, that railroad fiscal necessity only awaits a better market; and it may be that revived prosperity may be a solvent of the whole situation, leaving the railroads wiser for a harassing experience. But meanwhile that experience has been shared by the railroad investor. Within nine months he has seen his railroad security, whether junior or senior, shrink. The contraction has been large in stocks, slight in the "bedrock" bond. But it has been general. And the investor who, on rational grounds of long experience, was a year ago ranking the railroad as the most secure form of investment next to good realty or the municipal or state bond, is now timid and hesitant. And on his mental attitude, whether he is an old or new investor, whether he is watching stocks and bonds long held or is seeking new railroad investment, the future prosperity of the railroads very largely depends. His sentiment does not quite make the market nor condition railroad finances but it is a potent and very sensitive force.

He divides naturally into three distinctive groups. There is the ultra-conservative group—including many institutions—that seeks always the high mortgage railroad security. It is a very large group that rarely incurs serious losses but is apt to be acutely influenced by small ones. Next there is the group willing to take an edge of risk in the railroad junior security, including railroad shares—a group keen, shrewd and sharply watchful of railroad affairs, present and prospective. Finally there is the purely speculative group that takes its high risks in prosperity and adversity alike and not in very close touch with genuine railroad investment except now and then viciously as incarnated in the "high financier." It is not a sentimental group though it tries to make sentiment for better or worse but always for itself. On the first two of these three groups, on their confidence or the lack of it in the railroad security as such, it is that the railroad financing of the future rests. They are, of course, influenced by the material facts of railroad conditions such as corporation policy, personnel of management, traffic returns, condition of property. But over and beyond these there is what may be described as a "state of feeling" toward railroad investment that must be reckoned with and, if adverse, dispelled if the railroad is to regain its old hold upon investment confidence and in the case of the regular dividend payers re-establish itself upon a 4 per cent. basis or less.

To attain that benign result there must be co-ordination and harmony of forces. The railroad companies, on their part, have evidently still a good deal to learn as to unity of action—in such recent matters, for example, as the proposed increase of freight rates—and as to sinking the moderate or small vantage of the individual company in the general good. That to these are to be added such appeals to investment confidence as conservative financing, for the present at least rigid economies, and fuller publicity of returns goes with the saying. These are all important, not to say vital. But it is on the side represented by the state whose other name is the general public that the greater responsibility rests. Much of the existing railroad depression is undoubtedly to be charged to panic and post-panic conditions. But they are transitory and in their specific effects on railroad investment sentiment more or less remote. Not so the civic attitude and action in the case of the railroads during the last two years in both the nation and the states. They, more than all other events and influences combined, have shaken investment trust in the railroad security. Panic is but a passing spasm; the other, in the eye of the investor, has seemed overmuch a more permanent and dangerous ailment of the body politic. Its

cure, sure at last, but the disease in the meantime inflicting calamity, is the primal step to restored and enduring confidence in the railroad investment.

STATE RAILROADS.

On October 13, 1906, the English House of Commons ordered the compilation of a report showing in what countries, other than those covered by a previous report dealing with certain British possessions, the railroads had been wholly or partly built or acquired by the government; the cost of such building or acquisition and the date and terms of purchase; and the results for the financial years 1904-05, including revenue, expenditure, net profit or loss, together with particulars as to the amounts of capital, if any, redeemed out of revenue. This report, which was ordered to be printed in August last, has now been published, and deals with the railroads of 41 different countries. It contains a large amount of statistical information, but, unfortunately, yields very little in the way of conclusions, and we are not inclined to accept as gospel all the statements relating to capital expenditure, operating costs, and capital redeemed on state systems. As we have shown on various occasions, one of the conveniences of government ownership is the ease with which items of railroad expenditure can be hidden under the heading of "Miscellaneous Expenditure, Public Works," etc. The compilation bears evident impress of being largely derived from Consular reports and similar sources, which usually contain the minimum of information in the maximum space. Moreover, just those particulars that the practical man is likely to look for in a report of this nature are lacking and there is an almost entire absence of comparative data. One would like, for example, a detailed statement of the respective mileage of French railroads operated by the state and by the companies, while the statistical tables devoted to the German Empire are unaccompanied by any explanatory text. A certain number of interesting, if not exactly novel, particulars of various railroads can, however, be extracted from the report.

The 41 countries are divided into four groups of which the first and largest deals with those instances where the state owns and works the whole or part of the railroad system. These are India, Canada, New South Wales, Queensland, South Australia, Tasmania, Victoria, Western Australia, New Zealand, Cape Colony, Natal, and the Transvaal and Orange River Colonies, Austria-Hungary, Belgium, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Cuba, Denmark, France, the various states of the German Empire, Honduras, Italy, Japan, Norway, Portugal, Roumania, Russia, Servia, Siam, Sweden, Switzerland and Turkey. It must of course, be remembered that state ownership does not preponderate in all these countries, company control predominating for instance in France, Canada, and Brazil, while in Denmark the state owns 1,137 miles against 855 miles in the hands of more or less subsidized private companies. In certain instances, such as New South Wales, Victoria, and Queensland, the railroads have been almost entirely constructed by the government, while in other countries the government has acquired the systems and also undertaken the construction of new lines after acquisition. In some cases, the state undertook to build and own railroads before the general acquisition of the system was decided on.

In the second group are included countries where the state owns railroads, but has leased their working to private corporations. This is the method adopted in Newfoundland, the Netherlands and Nicaragua, where the whole railroad mileage is thus administered. It is also adopted in Brazil, where the state, in addition to owning and working certain railroads, has leased others, and in Bulgaria. The third group deals with countries in which privately-owned lines have received state aid, and comprises Denmark, France, Greece, Luxemburg, Russia, and Spain. In France, Greece, and Spain, the companies receive

concessions for a fixed period of years, at the end of which time the lines pass into the hands of the state. Financial guarantees are usually made in return for the limited term of company operation. The Danish government has the right to acquire the railroads at any time after a fixed period, and certain Norwegian railroads are jointly owned by the state and by local authorities. The fourth group is devoted to countries where the railroads were built by the state and have since been transferred to private ownership. Guatemala is at present the only example of this kind, though Italy was formerly a case in point.

As regards railroads within the British Empire, Indian roads occupy the first pages of the report. It is unnecessary to deal at length with the statistical details, as the figures only go down to the end of 1905. A rather interesting footnote is given under the tables of capital expenditure, indicating that the Secretary of State for India is "virtually in the position of banker to the companies, which pay all their capital over to him and draw on it when required. It sometimes happens that a company temporarily overdraws its account." Coming next to the state railroads in self-governing British Colonies, Canada is dealt with first. The Inter-Colonial Railway is the principal government line. Prior to federation in 1867, the Nova Scotian government built 145 miles of road, which, with about 100 miles constructed in New Brunswick by a subsidized company, were in 1867 turned over to the government. By subsequent building of new roads, lease, and purchase, the government had by 1906 a total of 1,445 miles in operation, which earned \$63,635* net. Its gross receipts amounted to \$7,856,160. As the total capital expenditure is given at \$118,630,165, this appears one of the instances of state administration where a working surplus is not a synonym for a commercial profit. The 192½ miles of lines, belonging to the Prince Edward Island Railway, on the 3-ft. gage, were taken over in 1874. The total length of this line was 261 miles in 1905. No capital expenditure has been paid out of revenue either by this or the Inter-Colonial. The Temiskaming & Ontario, under the control of a commission appointed by the Province of Ontario, and built with government loans, seems to yield a working surplus.

The railroads of Newfoundland are of particular interest. The system has a total length of 637 miles, on which the capital expenditure is \$11,861,040, and the entire system is leased to the Reid Newfoundland Company for 50 years from July, 1901. The company works and maintains the lines, "all revenue and expenditure being to their gain or loss, as the case may be." In 1905-06 this company lost \$130,365, revenue amounting to \$430,130, and expenditure to \$563,645. The Australian systems are next dealt with. Practically all the railroads are state-owned, the private mileage being at present inconsiderable, and the various governments also undertook most of the construction. The government of Cape Colony owned at the end of 1906 a total of 3,074 miles of road, of which 160 miles, representing five small lines, were acquired by purchase between 1872 and 1901. The Natal government at the same date owned 796½ miles in Natal and 88½ in the Orange River Colony, which, together with another 138¼ miles operated (88¼ in the Orange River Colony), makes a total of 1,023¼ miles operated by the government, on which \$68,303,805 had been spent. The last figure does not include 181 miles then in course of construction.

The railroads of the Transvaal and the Orange River Colony are under one administration. The Orange River lines were partially constructed by the Boer government out of revenue, and were therefore acquired free of cost after the war, although \$10,315,000 was paid to the Cape and Natal governments in liquidation of unpaid construction debts contracted by the government of the former Free State. The Netherlands Railway in the Transvaal was seized by right of con-

quest on the acquisition of that country, but the government subsequently decided, as an act of grace, to buy out the debenture holders on certain terms. This transaction is not yet completed. The Pretoria-Pietersburg Railway was expropriated for \$8,369,955. All these lines are vested in the High Commissioner, and administered by the Railway Committee of the Inter-colonial Council.

As previously mentioned, this report is of little, if any value so far as concerns any deductions possible therefrom. As it was ordered in response to a demand by Mr. Chiozza-Money, who, to judge from his recent journalistic utterances, is priming himself for a renewed campaign for the nationalization of the British railroads, the compilation appears to have been made in order to provide that gentleman with statistics at not trouble to himself.

NEW PUBLICATIONS.

The Railroad Signal Dictionary. By Braman B. Adams and Rodney Hitt. 9 x 12 in. 514 pages; 3,120 engravings. *The Railroad Age Gazette*, New York, Chicago, Pittsburgh and London. Morocco, \$6.

To the signal engineers and other railroad signal men of America this work should need little introduction, as their Railway Signal Association discussed the project a year ago, and authorized the publication of the book. The members of the supervising committee then appointed, Messrs. Anthony, Ames and Mock, are among the particularly well qualified members of the association, so that no one needs to be assured that the wishes of the members have been carefully considered. To other railroad officers, to students, beginners, non-railroaders and others the most comprehensive introduction for the book will be to say that the editors have had the benefit of all the resources of the Railway Signal Association, of the principal signal manufacturers of the country, and of the *Railroad Age Gazette* office; and that the principal railroad companies have responded freely to requests for drawings and information. Of the two editors, both long connected with the *Railroad Gazette*, Mr. Adams has been a close observer of signaling from its beginning in this country, and Mr. Hitt is an experienced technical dictionary maker.

This work, like the other dictionaries issued by the same publisher, is a fully illustrated encyclopedia of the subject treated; and as compared with the car builders' and the locomotive dictionaries it is much more complete in descriptions of processes and methods. The reason for this is found in the nature of the subject. The signaling art is comparatively new, and is constantly changing, and the literature of its operation has not kept pace with the rapid development. The illustrations of every important machine or apparatus, therefore, are accompanied by a minute and carefully prepared description of its working. By this feature the literature of American signaling is for the first time made complete and brought up to date. In the vocabulary, or dictionary proper, the general reader will find the means of settling many disputed points, and the student will find numerous difficulties settled.

The subjects covered by the more than 3,000 engravings may be briefly summarized as follows: Manual block signal apparatus, including machines for the controlled manual system, as used on both double-track and single-track, and the electric train staff; automatic block signals, including disks, enclosed and unenclosed, and electric, electro-pneumatic and electro-gas apparatus for semaphore signals; all the different arrangements of track circuits, with clearly explained diagrams of tracks and wiring; block signals for electric (trolley) railroads, and special designs of signals used in tunnels; all the standard manual interlocking machines, with the accessories used at drawbridges; power interlocking machines, including the "all-electric" (as made by the four principal American manufacturers), the electro-pneumatic and the low-pressure pneumatic; all of the different signal indications and aspects, fully illustrated, together with diagrams of track

*Reduced from pounds sterling at \$5.00.

showing the practice at yards, junctions, terminals and all possible situations; the different ways of working the block system, shown by conventional diagrams; highway crossing signals; accessories used in block and interlocking signaling, embracing everything of this nature which is in general use on American railroads.

For all important machines and mechanical structures the parts are described and illustrated in great detail, making the work a compact and convenient guide for use in ordering. The illustrations include every approved apparatus in use in the United States for either block or interlocking signaling.

Letters to the Editor.

THE PROBLEM OF HANDLING "ASTRAY" FREIGHT.

Chicago, Ill., July 30, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The "astray freight" problem in railroad traffic operation is a source of growing and endless trouble, as well as great financial loss, and consequent drain of railroad revenues.

Since the causes are largely the errors of human judgment and therefore cannot be entirely remedied nor wholly overcome, the conditions are met by applying the efforts of the entire traffic force to a greater or less extent in clearing up the thousands of such daily occurrences.

Freight "over" and "short" at large terminal stations is recorded and traced by each railroad independently by clerks assigned to that duty, who are usually comparatively new in the service and without the aid of a well-defined or adequate tracing system or personal knowledge and experience in the broad scope of general traffic. As a result, a large percentage of "astray" freight is never located or perchance is found subsequently, but too late for use of the consignee, and in consequence vast sums are paid out annually to satisfy claims of shippers for loss or depreciation of merchandise, and at certain periods all "over" or "on hand" freight unaccounted for is disposed of by auction or private sale, usually for a small percentage of its real value, to partially offset the paid claims.

Economical and conservative management could profitably adopt an effective tracing system for locating and adjusting quickly all errors of this nature. It is clearly within the possibilities of reducing such losses at least 75 per cent. through the establishment and operation of a central and joint clearing house system embracing all railroads, through which all "over" freight would be checked against all "short" freight and vice versa.

By a well-equipped bureau, through a perfectly devised system, "astray" freight, reported short at one station, would be readily located through report of "over" freight at other stations, regardless of its real destination, or the railroad upon which it should be found, and immediately restored to its legitimate carrier or to the consignee in time to prevent a claim for loss or depreciation of value.

The writer's own experience and practice proves that such a plan is entirely practicable, as instances are of almost daily occurrence where the "astray" portion of shipments reaches its proper destination over line competing with its rightful carrier, in which event it is problematical whether the proper carrier will ever discover the whereabouts of the missing freight; and likewise the delivering line with the "over" freight is seldom able, through the medium of its own tracing, to get the exact data surrounding the shipment.

Every package of "over" freight unclaimed represents a direct loss, for which some railroad has paid out perhaps a large amount; and as the value of nearly all freight depreciates more or less by reason of delay in delivery, it is incumbent upon the part of the carriers to expedite the movement and facilitate delivery in every possible manner.

A joint "over" and "short" tracing bureau would eliminate to a large extent, if not wholly, the troubles of every line both on local and through business and be of material assistance to the claim agents as well as the traffic and operating departments.

J. M. BLANCHARD,

Manager Freight Traffic, Siegel, Cooper & Co., Chicago.

REASONABLE RATES.

Iowa City, Aug. 1, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

1. The reasonable rate on any article the possible supply of which is very large, is "what the traffic will bear."

2. The reasonable rate on any article of very limited supply, all of which will move at any profitable rate, is such as to pay the transportation company a share in the total profits proportionate to the transportation company's share in the total effort of production and sale.

3. Reasonable rates as a whole are such as produce a reasonable profit rate of the total business done.

4. Railroad securities should consist of:

(a) Bonds—representing borrowed money.

(b) Preferred stock—representing money invested by the owners, stockholders, paying interest when earned, but sharing also in net profits.

(c) Common stock—representing ownership of good will, etc., and interest in the profits of the business.

There is probably nothing new to any one in the first thesis submitted, and the economist will recognize his "monopoly price" in the explanation. There may be nothing new in the second and third theses, but the writer has nowhere seen them formulated or explained as in this paper, though he understands they have been inferentially suggested by some writers on economics and possibly by some judicial decisions. The fourth thesis is supposed to be new. Although the form of the paper is didactic it is not submitted as the final word, but as suggestive only.

It is usual, when speaking of reasonable railroad rates, to speak of reasonable return on investments, on the cost of the road, or on the value of the road, either that of the physical property or capitalized earnings, but no one has succeeded in demonstrating that the investment, or the cost, or the value of the road, has any very immediate relation to reasonable rates for service. Considering any one commodity originating in any given place, it has been pretty well established that the reasonable rate is "what the traffic will bear." But much as this phrase has been used, it is not well understood by the laity, possibly not sufficiently well understood by some well-meaning railroad traffic men. The writer uses the phrase as meaning that rate which will move the economic maximum of the given commodity. And what is meant by the economic maximum may be illustrated thus: If the rate on California oranges is sufficiently high, a few only will be used by well-to-do families; if the rate be lowered appreciably, more oranges will be used and the shipments will be larger; if the rates are sufficiently reduced, oranges will become a common food and the shipments very large. As the rate is lowered from one that will move a few oranges toward the one that will move all that can be produced, a point is reached at which the net return to the transportation company will be a maximum. The rate producing this result is what the traffic will bear, and the volume of traffic moved, the economic maximum. It is recognized that this simple illustration does not cover all of the considerations of commercial competition of people and places, export problems, water competition, etc. But these are all considered in a given case in determining "what the traffic will bear."

Some years ago the writer undertook to show* that pas-

*Railroad Gazette, Vol. 31, 1899, p. 97.

senger rates in some parts of the country were too high when judged, as he interprets it, by "what the traffic will bear," and the correctness of the showing there made has since been demonstrated by the increased revenues following reduced rates in many sections of the country. His discussion also showed what has since been adjudged to be true, that in the Interstate Commerce Commission's third group of states, a reduction of fares would be of doubtful value.

Perhaps too much is assumed in the way of unlimited supply. A commodity, the supply of which is limited, and all of which will move under any probable rate, will yield a net revenue in approximate proportion to the rate, and the foregoing definition of what the traffic will bear fails; nor can the trite phrase be admitted as a definition of a reasonable rate in this case. In such a case, since the cost of handling the business cannot be ascertained with any reasonable degree of precision, what constitutes a reasonable rate must ever be subject to agreement between carrier and consignor, or consignee, and in case no agreement can be reached, must be determined by some board of arbitration, as the Interstate Commerce Commission. So many things must then be taken into consideration, cost of production of commodity, its value, profits of producer, middleman, retailer, cost of transportation by other routes or methods, and by the route in question so far as it can be ascertained, that what constitutes a reasonable rate cannot be discussed further than to say that as a general principle the transportation company is entitled to a share in the total profits between producer and final retailer inclusive, proportionate to its share in the total effort involved, and that this is not an easy matter to determine.

Competition in no degree affects the correctness of the general definition of a reasonable rate for a given commodity. The reasonable rate should be charged regardless of competition, indeed, competition should not hereafter be permitted until there is business enough for the original company and a proposed competitor. It is just as certain that public need should control the opening of new lines of railroad as that it should control the opening of new highways for wagon traffic. Roundabout routing by would-be but unnatural competitors involves economic waste and should be prohibited. It is coming to be recognized by thoughtful persons, both inside and outside of railroad circles, that there is already too much natural and unnatural competition, and that there is such a thing as a desirable agreement which should be made legitimate between competitors for the maintenance of rates at what the traffic will bear.

But the question just now before the people is, Are rates as a whole too low? Manifestly if the rates on all articles have been properly fixed at what the traffic will bear, the railroads are earning all they can, and if this is not enough for a fair return, either there are too many railroads or there is over-capitalization in the item of funded debt, or there is less than efficient management. Eminent railroad managers affirm that rates are too low, which must mean that they are not fixed at what the traffic will bear, and this suggests the question, Should rates be fixed at what the traffic will bear in times of prosperity, or in times of business depression; or should they vary with these times as do other manufacturers' prices?

For the railroad is a manufacturer. Its buildings and road-bed constitute its fixed plant corresponding to the buildings of a woolen mill, a cotton mill, or an automobile factory; its track is the driving belt of the great engines that are used in the manufacture of the finished product. The product is ton-miles and passenger-miles, and these the railroad tries to sell at a fair price. When a factory of the more usual character falls on hard times, its force is reduced, part or all of its machinery stopped, part or all of its buildings closed until the return of prosperity. The railroad cannot do this. It may dismiss a part of its employees; it may reduce in some measure its manufactured product of ton-miles and passenger-

miles by reducing the number of trains or the cars per train. But it cannot abandon all trains, nor can it close up any part of its fixed plant, except possibly a few repair shops. The railroad must still use its fixed plant and a considerable part of its machinery in the manufacture of ton-miles and passenger-miles whether or not these are all sold at a fair price or whether or not they are sold at all. A large proportion of the expense, therefore, goes on whether the business be good or bad. The railroad labors under another disadvantage; if it overstocks to-day it cannot sell the surplus to-morrow or next week. The ton-miles and passenger-miles manufactured by the running of a single train must be sold on that train or lost entirely. What effect a concerted horizontal reduction of railroad rates and manufacturer's profits might have on business in a time of depression is altogether problematical, and such a reduction would at any rate be almost if not quite impossible of accomplishment. In a time of prosperity there approximates the condition of unlimited potential traffic, while in a time of business depression the amount of traffic is limited, can probably not be greatly increased by a reduction in rates, and therefore, peculiar as it may seem, what the traffic will bear as defined in this paper is likely to be a higher rate in a time of business depression than in a time of prosperity, and the reasonable rate must be determined on an altogether different basis.

The railroad must continue to manufacture whatever ton-miles and passenger-miles are called for, and by reason of its character, many that are not called for and are lost. The public demands this and the railroad cannot refuse. It should therefore be accorded a reasonable profit, even in times of depression, suffering perhaps a reduction in the amount of profit as its share of the general trouble. Periods of depression are usually short as compared with periods of reasonable prosperity, and hence, if a profit during prosperous times sufficient to provide a surplus to tide over the following depression is permitted, no change in rates will be necessary, even though some business is done at a loss; but if such profit be not permitted, rates should be raised during the periods of depression. It is possible even that rates might be reduced during the depression if the surplus of prosperity be large enough. Experience would show how great the surplus carried should be. As a matter of economy and simplicity of administration and publication, if any such change in rates is made during the period of depression, the change should so far as possible be a horizontal one of so many per cent. "So far as possible" is intended to cover those few or many items which would bear no change.

Whatever period should be chosen for determining what the traffic will bear, the broad question of whether rates as a whole are too high or too low should be determined on a different basis from any the writer has seen advanced. This is the volume of business done. The writer has recently presented this basis to his students in the introduction to a book on a related subject,* but could not there elaborate the thought.

The successful merchant or manufacturer expects as a net result of his investment and business enterprise a profit of some definite percentage of the business he does. Let this percentage be 15, for example. The merchant invests \$10,000 in his business and employs his time in its conduct. Perhaps he turns his capital over ten times in the course of the year and does a \$100,000 business measured by his sales. His gross profit he is likely to figure at one-third of the selling price, the precise amount depending somewhat on the character of the business and the ideas of the merchant, with the expectation that this profit will pay expenses and yield his fair profit of 15 per cent. of his sales. In his expenses should be included a fair interest on his actually invested capital of \$10,000, which he might have placed at interest in bank or invested in railroad securities, for instance, and a personal salary commensurate with the magnitude and importance of

*Elements of Railroad Engineering.

the business. Shall not the same standard of success be applied to the railroad corporation? It is perhaps not so easy to apply to an old corporation because it is difficult to determine just what the invested capital is. In some instances the entire cash sum actually invested is represented by the funded debt. Sometimes it is not even so much as this, but more commonly it is somewhat more than the funded debt, and in some few instances may be as much as the par value of the entire funded debt and stock. To a new road created under proper regulation, or an old road reorganized under proper supervision, the merchant's business standard may well apply, and to an old road over-capitalized, in the matter of funded debt, the standard may still be applied without more serious wrong to anyone than would result from any other rational standard.

Just what percentage of profit may be reasonable must be determined by common consent, and should be as nearly as can be ascertained, the commonly accepted business man's profit. This the writer supposes from various inquiries to be from 15 to 16% per cent., or from one-seventh to one-sixth. It sometimes falls as low as 10 per cent., and is sometimes as high as 20 per cent.

To make the standard easily applicable the financial organization should be somewhat as follows. If possible, the bond issue should represent at par the full cash cost of road and equipment and the sum necessary to start the business, and the stock should be purely speculative. With a new road this will usually be impossible for legal and business reasons, and therefore so much of the stock subscription as is required to be paid in cash for the use of the road should be represented by preferred stock that will bear interest at the rate of the bonds, if the interest is earned, and will also thereafter share with the common stock in the distribution of any profits that may be earned.

The stock that is given as a bonus for any purpose should be the common stock. The preferred stock should be always fully paid, and may properly carry with it a bonus of common stock, as may the bonds, if sales cannot be otherwise effected. This common stock would be purely speculative in character and would represent the right of the holder to a share in any profits that might be earned. Subsequent permanent improvements charged to income should be represented by preferred stock distributed as a stock dividend. It makes no difference how large the stock issue eventually becomes, so long as the net profit on the total business is not more than a reasonable percentage. In determining this net profit there should be deducted from the gross receipts:

1. Operating expenses, including necessary sinking fund payments for renewals.
2. Taxes.
3. Interest on funded debt.
4. Rentals.
5. Interest on preferred stock.

Permanent betterments charged to income should not be deducted but should be included in the net profit, and an equivalent dividend of preferred stock issued.

When individual rates of what the traffic will bear produce a total income of more than a legitimate profit rate on the business done, the surplus should not be subject to confiscation by the state. The regulation should be a police regulation and not one of eminent domain, and it should be required that the surplus be used for the permanent betterment of the property, preferred stock dividends being issued to cover this added value. In America this policy will be wise for many years to come, until our half built railroads are completely built and equipped for the highest degree of efficiency and safety in operation.

When, after a fair trial for a number of years, individual rates of what the traffic will bear, with efficient management, which must be supposed, produce less than a reasonable profit on the business done, there is probably no public need for the

road, and the enterprise should be considered less than successful, but it need not be considered a failure if it pays interest on its total cost. If it does less than this it should be abandoned as any other unsuccessful business.

If it could be legally provided that public need must be shown before any new road could be created, there would be little likelihood of any road failing so long as its administration was honest and reasonably efficient.

Based on the principle of this paper, it is thought safe to venture the assertion that freight rates as a whole are too low to yield a proper return during this period of depression, and that they were about right during the year 1906, though insufficient to carry a surplus for present needs.

WILLIAM G. RAYMOND, C.E., LL.D.,

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A SOLUTION OF MR. NICHOLS' PROBLEM.

Naugatuck, Conn., July 30, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Availing myself of your invitation in the issue of June 26, page 369, I will give my understanding of Rule 94 as applied to the case cited by Mr. Nichols. The reference is to the second paragraph of that rule as contained in the last revision of the Standard Code, and it reads in part as follows:

When a train, unable to proceed against the right or schedule of an opposing train, is overtaken between telegraph stations by an inferior train or a train of the same class having right or schedule which permits it to proceed, the delayed train may, after proper consultation with the following train, precede it to the next telegraph station.

To present the case briefly the situation is this: No. 10 and Extra E are at C running toward D. Extra 2 and Extra 4 in the opposite direction are at D. No. 10 is held by a meeting order with Extra 4 but has no restriction as to Extra 2. The case is reversed for Extra 1 and it is held for Extra 2 but can proceed against Extra 4. At C Extra 2 is held for No. 10, but can proceed against Extra 1. With Extra 4 the combination is reversed; it is held for Extra 1 but can move against No. 10. Two pairs of trains are facing each other. Each train is held for one of the opposing trains but can move against the other, and Mr. Nichols says that each agreed to help his neighbor and set out to do so in much the same manner that a certain worthy gentleman was once reputed to have made an earnest endeavor to lift himself by his boot straps. The rule says that if a train is unable to proceed, as was described, and is overtaken by a train having right or schedule which permits it to proceed, the former may precede the latter on the strength of the latter's right or schedule. Not one of the four trains has "right or schedule which permits it to proceed" and not one of them can move. Every one of them is held either by train order or by lack of time against a superior train. You may be able to proceed against a dozen trains but if you have an order to meet one extra you do not come under the title of "right or schedule which permits it to proceed." You have nothing which permits you to proceed until you meet that extra. Right is conferred by train order and not one of the trains have enough of it to move. Schedule is conferred by time-table but you cannot use your schedule to proceed if you have an order to meet another train. No one of the trains can move without borrowing authority from the other and not one of them has any authority to give away. If you did borrow it, it would simply be borrowed authority, it would not be "right or schedule which permits it to proceed."

The train must have something before it can give it away and unless it can move of itself, by "right or schedule," it cannot very well invite another train to go along with it.

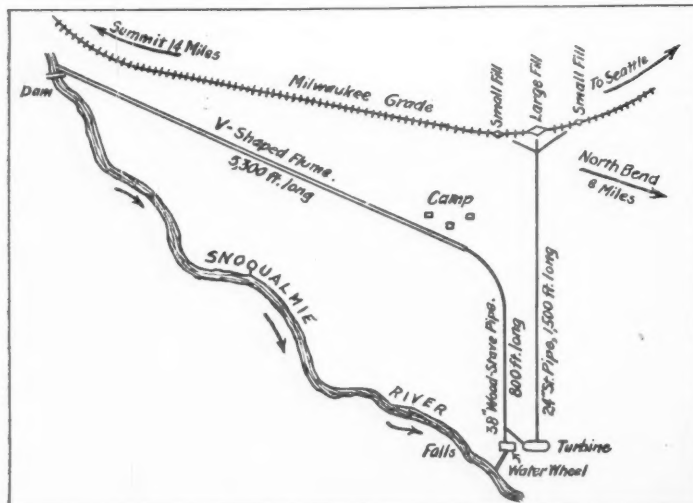
The second paragraph of Rule 94 is not defective and cannot be defective for the reason that the privileges it grants are conditioned entirely on the fact of some particular train having authority in itself to move, either by time-table or train order, and the Standard Code is so arranged that only one train can have such privilege at one time. H. A. DALBY.

THE SMYTH CAMP EMBANKMENT; C. M. & ST. P.

BY GEORGE HOLMES MOORE,

Seattle Secretary, American Institute of Electrical Engineers.

In order to share in the heavy traffic anticipated for the Alaska Yukon Pacific Exposition, the Chicago, Milwaukee & St. Paul is making unusual efforts to reach Seattle before the fall of 1909. Its route crosses the Cascade mountains about



Plant for Hydraulic Filling; C. M. & St. P.

70 miles southeast of Seattle, and some of the difficulties met with in construction in this section are very formidable.

In modern railroading it is, of course, essential that grades and curves shall be kept at a minimum, and in the case of the Chicago, Milwaukee & St. Paul this is the more important since that road must meet the competition of the line now building down the Columbia river. The latter is the Northern Pacific, under the temporary name of the Spokane, Portland & Seattle. It has the river grades all the way to Portland, and an easy grade thence to Seattle, and should therefore be able to make a time schedule considerably shorter than any now in effect.

The St. Paul, in its efforts to meet this competition, is forced to extra exertion to obtain minimum grade and curvature, and this demands the expenditure of immense sums on its right-of-way through the Cascades. For example, it is said that one mile of roadbed at a point eight miles from North Bend, Wash., will cost not far from \$300,000; this amount being necessary to secure the standard maximum of 1.74 per cent. grade and 10 degrees curvature.

Very considerable difficulties result from the two factors of rugged topography and heavy timber. The latter of these, in the clearing of the large lateral areas demanded by high embankments, becomes, by reason of the gigantic trees of Washington, an item of very heavy expense. Thus, at Smyth camp, a right-of-way over 700 ft. wide at its maximum point, had to be cut through virgin forest, and although work was started about April, 1907, the work of blasting and burning the timber was not completed until the middle of the following November.

At the point above mentioned, an embankment is being built on which the roadbed will be 280 ft. above the elevation of the outer toe. The length of this embankment approximates 900 ft., its greatest lateral dimension is 706 ft. and its volume is stated by the contractor in charge to be about 750,000 cu. yds. It is thought to be the largest railroad embankment in the world. This claim, however, must be taken as referring to the extreme height of the fill rather than to its volume, though the latter item places the work in the highest class.

It will at once appear to the railroad engineer that much expense could be saved by throwing a steel bridge across the

gulch. This was, in fact, considered, although the depth of 280 ft. and the length of 900 ft. would make even this plan a serious problem; but the fundamental difficulty arises from the impossibility of securing foundations for bridge piers, because the whole site is sand and gravel, no rock at all having been so far discovered by the numerous pits and borings.

The work is to be done entirely by the hydraulic method and material will be taken from adjacent cuts more than sufficient for the purpose. Actual washing was begun early in November, 1907. In order to supply the necessary water under sufficient head, a plant has been installed which is believed to be unique in its way. It consists of but one unit, a 1,500 h.p. Risdon water wheel flexibly connected to a four-stage, Worthington turbine. The turbine is calculated to deliver 9,000 gal. per minute, under a head of 350 lbs., and by the original design of the plant it takes water at its suction under a pressure of 175 lbs., the pressure which operates the water-wheel.

The site of the plant is just at the base of the upper falls of the Snoqualmie river, and it is thought that during the maximum loading—if this should happen at extreme low water—the whole volume of the falls may be diverted through the plant. The rough and ready adaptation of the resources at hand to the end in view is admirable, for though no essential has been forgotten, each is attained in the simplest manner possible.

The water is diverted from the south fork of the Snoqual-



Waterwheel-Turbine Unit.

Wood pipe at left of picture. Steel pipe at right.

mie river at a point almost exactly a mile above the upper falls. At this point the river has cut a way through the solid rock, and it was an easy matter to build a rough crib work of logs across the channel. This was faced on the up-stream side with two layers of inch planking, joints being broken to increase water tightness. The crib work was later filled with

rock and finally with refuse, leaves and dirt. Holes below the dam were stopped with rock and bags of sand, not a specially difficult matter since the maximum depth of water is only about ten feet.

The impounded water is conveyed to the penstock through 5,300 ft. of V shaped timber flume. Here, again, we have the

two layers of inch planking, the inner battening the outer. The flume is a right-angle set on edge. It is 5 ft. on a side and therefore has a maximum depth of something like 3 ft. Its maximum cross-section of water carried is about 12 sq. ft., and it has a uniform grade from dam to camp of 0.3 per cent., this giving a difference of elevation of only 16 ft. in

the 5,300 ft. from head gate to penstock. One of the interesting features in connection with the obtaining of this grade is that the public road had to be changed in four places, rough log-bridges for the roadbed being built at these points. Traffic was suspended by consent of the county commissioners for one day while these bridges were being put in and the road regarded to suit them. The flume is sustained on pole trestles for the most part, some of these over the deeper gulches being 40 to 50 ft. high.

At the lower end of the flume the water empties into the penstock, a 38-in. wood stave pipe, which drops sharply down hill at an average gradient of 30 per cent. to the plant on the riverbank below the falls. This pipe is made up of 2 in. by 6 in. planking in lengths up to 15 ft., which is planed to correct sections for the curve, at a sawmill some two miles below the camp. At the ends of each plank a saw cut was made edgewise to allow of inserting a thin steel plate to make the joints water tight. The planking was built into circular form on the ground, and bound together by half inch iron rods bent to a circular shape and equipped with screw-tighteners. Owing to the sharp descent which this pipe makes, steel bands are fastened at frequent intervals and these are guyed to nearby trees with steel cable. The pipe follows the ground surface, very little attempt at grading having been done. The steel banding varies in spacing from about 10 in. at the top to about an inch and a half at the bottom. The pipe is 800 ft. long and drops approximately 400 ft. in that distance.

The pipe terminates in a heavy block of concrete, comprising both a buttress for the weight of the two water columns, and a diversion-chamber for the water. From this chamber the water divides into the turbine supply pipe on the one side and the four double nozzles of the water wheel on the other. The turbine supply pipe is of 24 in. steel, and the water goes to the turbine at an initial pressure of 175 lbs. It is needless to say that the usual troubles experienced at a turbine suction are



Partially Completed Fill. Note Deposit of Fine Material Inside of Course.

not expected, as the turbine will get all the water it needs without any effort on its own part in inducing a vacuum.

The turbo-water-wheel is surprisingly small and compact, the whole set occupying a space of something like 6 x 15 ft. The water-wheel consists of four wheels of approximately Pelton design, mounted on the same shaft. Each is 36 in. in diameter, and each has 16 cast buckets. There is no hood or casing other than the simple timber box built over the wheels to protect the operator from the spray. Each wheel is fed by a brass double nozzle controlled by a hand-wheel gate-valve. The nozzles are set to strike two buckets apart and have an exit diameter of $2\frac{1}{2}$ in. There is no governor control. The water wheel is flexibly direct-connected to its turbine by a flange coupling whose peripheral strain is taken by four links of leather belting, each link being of sixteen thicknesses of $\frac{1}{4}$ in. belt.

The turbine is of special design for this installation, made by the Worthington Pump Co. It is of the four-stage type, taking water at 175 lbs., and delivering at 350 lbs. The latter item requires rather heavy steel-work, and the turbine is therefore reinforced by heavy peripheral steel ribs in the casing casting, and has been tested to 400 lbs. pressure. The turbine delivers to an 18 in. discharge pipe, which changes at the concrete chamber to a 24 in. steel pipe which goes to the site of the fill. This pipe is of the lap-riveted type built in 6 ft. sections and assembled for handling in 30 ft. sections. It is 1,500 ft. long and rises in that distance to an elevation of 600 ft. above the turbine. It varies in thickness from $\frac{5}{8}$ in. at the turbine to less than $\frac{3}{32}$ in. at the nozzle end.

One interesting feature of the plant seems at first sight to be doubtful engineering. This is that all the water used on the fill is led down to the plant and then pumped back over nearly the same route. However, this becomes necessary from the fact that the nozzles are some 600 ft. above the plant, and therefore 200 ft. above the end of the flume. In addition to this lift of 200 ft., a pressure of 90 lbs. at the nozzles had to be provided for, and this results in a pressure of 350 lbs., or an equivalent total lift of approximately 800 ft.

To understand the operation of the plant, it is necessary only to consider that the 38 in. supply pipe divides at the water chamber into two channels. One of these supplies the four double-nozzles of the water-wheel, and the other supplies the turbine.

One striking feature of the installation is its extreme simplicity, there being no complication of any sort. No governor at all is used, the only method of control being the four hand-wheels of the gate-valves for the water-wheel. There is a remarkable absence of valves, the most striking of which is the omission of all check-valves, and one of the odd things resulting from this ultra-simplicity was the flattening of the upper end of the steel pipe caused by a failure of water in the flume and penstock. The four small air-valves were seemingly unable to supply air sufficient to prevent the resulting vacuum. This mishap was not serious, since the pipe rounded to shape as soon as pressure was restored.

Perhaps the most conclusive instance of the large scale of expenditure is found in the concrete culvert. This is 706 ft. from portal to portal, and is said to have cost \$20,000 to build. It will carry under the embankment the waters of a small stream whose course has been temporarily diverted. Its section is oval above a slightly dished floor, the maximum height inside being $5\frac{1}{2}$ ft.

The material at the site of the fill lends itself most readily to the hydraulic method, since it is a mixture of sand and gravel, a mixture which is considerably easier to handle with water than either sand alone or gravel alone.

Sydney Smyth, the contractor in charge of the work, hopes to be able to move an average of 10,000 yds. in 24 hours and to attain under the most favorable circumstances a removal of 30,000 yds.

As a final comment, it is interesting to note that this em-

bankment is to contain only about 60,000 yds. less than the amount taken from the Culebra Cut on the Panama Canal during March of 1907, and is considerably greater than the average monthly excavation at that famous point during the early months of that year.

JOINT INTERCHANGE AND INSPECTION BUREAUS.

The question of the advisability and feasibility of establishing joint interchange and inspection bureaus at centers of traffic where large numbers of cars are interchanged between different railroads has recently been receiving widespread consideration. At a number of cities joint inspectors are employed by the mechanical departments to inspect cars interchanged under M. C. B. rules. At only one city in the country—Denver—is a joint bureau maintained for gathering data for the operating departments regarding interchanged cars. At a very large majority of interchange points each railroad employs yard clerks to report upon the cars interchanged for its operating department and inspectors to report upon them for its mechanical department, the result being that each car interchanged is inspected in one way or another four times—by the yard clerk of the delivering line; by the yard clerk of the receiving line; by the inspector of the delivering line, and by the inspector of the receiving line. It is deemed not impossible that a plan will be worked out under which the duty of reporting and inspecting for both the operating and mechanical departments of both the delivering and receiving lines, will be intrusted to bureaus representing the lines doing business at each interchange point, this bureau to send its reports to the car accountants and the mechanical departments of not only the delivering and receiving lines but also to the car accountant and mechanical department of the line which owns the car that is interchanged, when the owner line happens not to be either the delivering or receiving line.

Some of the advantages that are claimed for the bureau plan are as follows:

1. There will be one man in general charge, with no duties to take his time and attention but this one thing.
2. The work being specialized, employees become experts in this particular line of work.
3. By having the interchange and inspection reports of all the car accountants or superintendents of car service and all the master car builders made in one place, typewriters can be installed and used, and there is as much saving in making interchange reports on the machine as in handling office correspondence on the typewriter instead of in long hand.
4. The data for the operating department is gathered as fast as the transfers are pulled and the interchange reports are practically up-to-date all the time. The reports may be closed at noon or at 6 p.m., or at whatever time best suits the train service, and sent in, and the balance of the day's interchange can be sent on a later train.
5. Disputes as to dates, time of interchange and initials, numbers and condition of cars are avoided.
6. In the settlement of claims the case of no road is weakened, as is often true now, by a disputed seal record, icing record or ventilating record.
7. If the plan is worked out on right lines, the owner of a car will receive much more prompt information than now as to where it is. Example: If the Burlington delivers a Denver & Rio Grande car to the Colorado & Southern at Denver, the car accountant of the Denver & Rio Grande will receive advice, by means of a junction car, not later than the following day, whereas he now must wait until the report is sent from Denver (the city in which the Denver & Rio Grande car accountant is located) to the car accountant of the Chicago, Burlington & Quincy at Chicago—1,021 miles—in order that the Burlington car accountant may advise the Denver & Rio Grande car accountant of the delivery.

8. The aggregate expense of reporting and inspecting interchange cars will be substantially reduced.

In the early history of railroads freight cars usually stayed at home. What little traffic moved beyond the initial line was transferred at terminals. As business increased transferring freight at terminals became burdensome and the system of car interchange was adopted. Interchange has now attained such magnitude that during seasons of heavy traffic 1,000,000 freight cars are constantly away from the home lines—that on the average 250,000 freight cars are interchanged daily and millions of dollars are involved annually in car service settlements. The necessity for the greatest possible accuracy in interchange reports, which form the basis for all data for settlements aggregating this immense sum, is apparent.

The status of interchange and inspection at a number of traffic centers is given below:

DENVER.

When the per diem rule was adopted in 1902 the railroads at Denver decided that it was expedient to establish a "Car Interchange Bureau" to keep independently for all of the roads concerned records of the cars interchanged, and the Denver bureau has been in operation since July 9, 1902. The roads forming this bureau were the Burlington, Colorado & Southern, Denver & Rio Grande, Denver, Lakewood & Golden and Union Pacific. The membership of the bureau consists of local freight agents of the companies parties to the agreement at Denver. The rules of agreement, among other things, provided for the employment of a joint agent who should be elected by the bureau and hold office until his removal or resignation; who should employ, subject to the approval of a majority of the members, as many clerks and messengers as might be required to maintain a record of all cars interchanged by the parties to the agreement, these employees to act under the direct supervision of the joint agent.

Section 2 of Article V. of the articles of agreement of the Denver Bureau of Interchange reads as follows:

"The duties of the agent shall be to see that a record is maintained of all cars interchanged by the railroads parties to this agreement, and to supply members with as many copies thereof as may be required for station records and in lieu of junction reports for car accounting officers; records shall show car number, initial, kind of car, time set on transfer track, time inspected by joint inspector, time pulled from transfer, destination or consignee, as per carding, contents, stenciled weight, capacity, seals on all doors, including tops and ends; also icing and ventilation record of perishable freight, viz., amount of ice in the tanks of refrigerator cars, or if none, records must so state; position of plugs and ventilators; condition of drain pipes, drip pans and traps; and whether water is flowing freely therefrom; and condition of shipment, if inspected.

"He shall see that the rules covering interchange are observed by all concerned in all cases of interchange of cars between railroads represented in this bureau and shall act in behalf of both the delivering and receiving lines in carrying out said rules. He shall examine the condition of all freight interchanged in stock or open cars, and in case freight is in a damaged condition, improperly loaded, or shows any evidence of loss, shortage or pilferage; or in case of live stock dead, crippled or otherwise injured, overloaded or down, he shall immediately report the facts to agents of the delivering and receiving lines, such notice to be confirmed in writing as soon as practicable."

Each member was required to supply the agent with copies of rules of his company as to kind or class of shipments which may or may not be accepted from connections, and it was made the duty of the agent to report to the local freight agent of each company interested violations of such rules. The agent was required to furnish the president of the bureau a statement of cars received by and delivered to each road, which statement was to be the basis of payment by each company of its proportion of all expense of the bureau.

C. W. Loomis, agent of the Chicago, Burlington & Quincy at Denver, read a paper at the annual meeting of the American Association of Local Freight Agents' Associations at Toledo, Ohio, in June last, in which he described the operation of and the results secured under the "Denver Plan." He said that the articles of agreement originally adopted still remained unchanged except that the joint agent was now being paid more than when the bureau was first organized. The

expense of operating the bureau, when it was organized, was about 25 per cent. less than what it had cost the various roads in the aggregate to get the information and make the reports handled by the bureau, the reduction in expense being due to the fact that there was no duplication of work under the new arrangement; and what was true at first, Mr. Loomis said, is much more emphatically true now. He added that the greatest benefits to be derived from a joint arrangement of this kind, are that the joint agent and his subordinates are all neutral and will report the facts as they find them, not leaning to any one road because they are hired, discharged and receive their pay from that road. He said that joint reports are more accurate than the reports of individual lines, and, being all made at one writing, they are identical as received by the various car accountants, which does away with much unnecessary correspondence for the purpose of ascertaining correct car numbers, initials, seals and the actual dates when cars were interchanged—correspondence that is often necessary when two reports are issued, one by the delivering and one by the receiving line. The method of procedure of the Denver interchange bureau was described by Mr. Loomis as follows:

"Our joint agent has his car checkers or transfer clerks stationed around on different transfers or in districts. One man may look after two or three different transfers if they are sufficiently near each other for him to give them proper supervision. At each one of these points where the car checkers or transfer clerks are located they have telephone connections, so that the joint agent, local agent or yard master interested, or any of their force, can get in quick communication with any of the transfers and ascertain just what the conditions are on that transfer. It is also the duty of the transfer clerk when he receives any stock, perishable time freight or any important carload freight, to promptly report it by telephone to the agent and the yard master interested, so that same can be promptly handled. We can all see of what great value prompt information of this kind is to an agent and yard master."

Mr. Loomis said that, in his opinion, in connection with the joint arrangement for checking and reporting cars interchanged there should also be a joint arrangement for inspection to avoid delay to important freight. The total number of cars interchanged at Denver during the previous year was stated by Mr. Loomis to have averaged 38,000 cars per month.

For the year ending April 30, 1908, the total cost of the interchange bureau was 2¼ cents per car interchanged, or 1½ cents per car per line. A movement is on foot at Denver to merge the interchange inspection (now handled by the mechanical departments) and the interchange bureau (handled by the operating departments) so that both classes of work will be handled by one organization.

The American Association of Local Freight Agents' Associations has authorized its conference committee to take up with each interchange center the matter of establishing similar joint arrangements to fit the local conditions and to confer with the car accounting officers to this end.

ST. LOUIS.

The establishment of a car interchange bureau similar to that at Denver was considered by the Central Association of Railroad Officers, St. Louis division, in conjunction with the Local Freight Agents' Association of St. Louis in the early part of 1906. A committee of the Local Freight Agents' Association favored the establishment of such a bureau, but the matter was dropped until the early part of 1908. On May 23 last a meeting, called by D. I. Forsyth, Superintendent of Transportation of the Wabash, to consider what could be done to improve interchange reports at St. Louis terminals, was held. E. F. Kearney, Superintendent of Transportation of the Missouri Pacific, was Chairman, and J. E. Taussig, Superintendent of Terminals of the Wabash, was Secretary. Most of the representatives of the St. Louis roads present, who included car accountants, superintendents, local agents and superintendents of transportation, expressed themselves favorably to the bureau plan, and a committee of five, composed of representatives of the Illinois Central, Missouri Pacific,

Terminal Railroad Association, Toledo, St. Louis & Western and St. Louis & San Francisco, was appointed to investigate and report to the chairman. It is expected that the entire matter, after the committee's report is received, will be referred to the Central Association of Railroad Officers for final disposition.

Roughly stated there are 250 interchange inspectors and 200 yard clerks at St. Louis, and the number of cars interchanged is estimated at 300,000 monthly. While at St. Louis and East St. Louis each road employs its own clerks to take the initials, numbers, etc., of interchanged cars, the roads there have a chief joint inspector who reports to and receives his instructions from an executive committee representing the transportation and mechanical departments of the different roads. Each road employs its own inspectors and they do not inspect for any line but their own. A movement is under way to have all the inspectors employed by the chief joint inspector and to inspect wherever they can be used to best advantage. There is a great deal of sentiment in favor of having one joint interchange and inspection bureau.

MINNEAPOLIS AND ST. PAUL.

A joint meeting of representatives of the Master Car Builders' Association and the Twin City Association of Car Service Associations was held in St. Paul on May 11 to consider the expediency of establishing a joint bureau of interchange and inspection. It has been estimated that under the plan of joint interchange and inspection in the Twin cities 12 inspectors could be saved and that a proportionate saving in yard clerks could be made. A resolution was adopted that it was the sense of the meeting that a joint bureau of inspection and interchange should be established in the Twin cities, and the chairman appointed a committee of six master car builders and six car service officers to take up the matter in detail and report at a meeting to be called by the chairman. It is understood that this committee has its report practically complete and that another meeting will be held in the Twin cities in a short time. The roads interchanging cars at the Twin cities now contribute to the pay of neutral men who gather up the interchange reports daily, making comparisons and recording any differences found. This is the only joint service provided for.

NIAGARA FRONTIER.

At Buffalo an interchange inspection agreement has been in effect since April 1, 1907, that covers the entire Niagara frontier. Each road employs its own inspectors, but they are under the supervision of an arbitrator employed jointly by the roads, with a few exceptions. This arbitrator reports to and receives his instructions from an executive committee, composed of local representatives of the operating and mechanical departments. Each road employs its own clerks to take the initials, numbers, etc., of cars and report them to the operating department.

The Buffalo Local Freight Agents' Association on April 21, 1908, passed a resolution declaring it to be the sense of the members

"That the making of joint interchange reports and the handling of joint interchange work under the jurisdiction of a bureau is practicable and desirable and less expensive than the present plan of each road preparing its own reports and handling its own interchange work."

KANSAS CITY.

The matter of establishing a bureau for the joint interchange of freight cars at Kansas City was considered at a meeting of the Local Freight Agents' Association of that city last April and a committee is working out a plan. At Kansas City each road employs its own inspectors and yard clerks. The inspectors work only for the lines that employ them, but are under the supervision of a chief joint inspector. About 100 men are employed by the mechanical department as inspectors and about 90,000 cars are handled each month in interchange movement. A movement is under way to have these inspectors carried on the pay-roll of the chief joint inspector and to act neutrally, inspecting both ways instead of

for one line only. It has been estimated that 60 to 70 men could then do the work for which 100 men are now paid. Each road at Kansas City also employs its own yard clerks to take the initials, numbers, etc., of delivered and received cars. The plan contemplated is the creation of a bureau to gather all this data, the idea being to have the data collected at a point where the delivering road's engine cuts off and the receiving road's engine hooks on and to be done by neutral men. Each agent is to be furnished by the bureau with all the data needed as to the transactions taking place during the day, and the bureau office is to work up the interchange reports for the car accountants, thus insuring uniform blanks and information to all instead of each agent working up this information, and there being used as many shapes, sizes and colors of cards, and arrangements of information, as there are roads in Kansas City. It is thought these two classes of work can be merged into one bureau.

CLEVELAND.

At Cleveland inspectors employed by the mechanical departments are neutral men, but they are carried on the payrolls of the individual roads. They inspect wholly under the direction of the chief joint inspector. It is stated that when the plan of having inspectors act neutrally was adopted the force employed was reduced almost 50 per cent. In a number of cases, yard clerks are employed jointly to gather initials, numbers, seals, etc., of cars interchanged, but as a rule each road does this work independently. The interchange tracks in many cases are insufficiently covered, yet more time, it is asserted, is taken in handling the interchange work for the operating departments, which is done poorly in many cases, than is used in inspecting cars, which is done well. An effort is being made to get adopted a plan for the employment of neutral yard clerks and the merger of the organizations for interchange and inspection into one bureau which shall be supervised by one head, this bureau to make up uniform interchange reports for all the car accountants.

INDIANAPOLIS.

On July 23, G. H. Waldo, Superintendent of Car Service of the Cincinnati, Hamilton & Dayton, sent out a circular letter to all interested lines, proposing the adoption by letter ballot of a resolution to provide that the Central Association of Railroad Officers, Indianapolis division, organize a central interchange bureau at Indianapolis for the purpose of securing more correct data on the interchange of cars between railroads by having these reports made up and checked by a joint office. The proposed resolution provides further that if the consent of the board of managers of the Indianapolis Union Railway can be secured the proposed bureau shall be placed under the charge of the Auditor of the Indianapolis Union, and that the expense incurred shall be pro rated among the members of the bureau according to the number of cars interchanged. The per diem committee of the Central Association of Railroad Officers is requested by the proposed resolution to arrange to carry it out, if adopted. Mr. Waldo in his circular letter expresses the view that it will not cost the roads at Indianapolis, which is a complex terminal and has given car record offices much trouble, any more to maintain the proposed bureau than it does to collect the desired information at present, and that the chances are the cost will be reduced.

TERRE HAUTE.

It is probable that a joint inspection and interchange bureau will be established in due time at Terre Haute, Ind. A committee representing the local agents and the mechanical officers of the Terre Haute lines met on July 22 to consider this matter. The committee went no further than to recommend the adoption of rules which provide in substance that after a loaded car gets into a receiving line's yard any repairs which are found necessary shall be made there instead of the car being sent back to the delivering road for repairs. This includes repairs of defects in safety appliances. At present the time of over 24 men is used in the inspection and report-

ing of cars at Terre Haute for the operating and mechanical departments, and the committee estimates that by the establishment of a bureau this number can be reduced to 18.

One of the interesting features of the plan which will probably be adopted at Terre Haute is the issuance of a junction card to the owners of interchanged cars. Under the plans of interchange in effect at most terminals the agents of the delivering and of the receiving roads report to their respective car accountants the interchange of the car, but if neither the delivering nor receiving line, happens to be the owner, the owner must wait to receive information regarding the car from the car accountant of the delivering road, the result being that the owner of the car is often very long without information as to its whereabouts. Under the plan of having the owner sent a junction card, the owner's car accountant would receive information regarding the whereabouts of the car much earlier than at present.

CONTINUOUS BRAKES IN EUROPE.

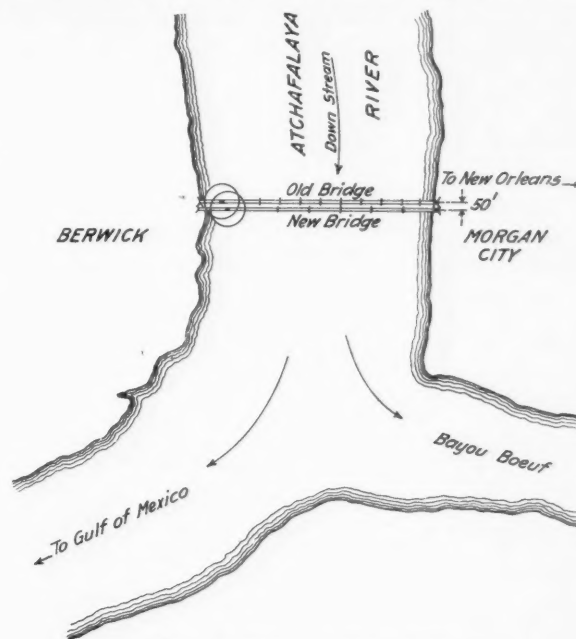
At the third international conference of the Technical Railway Union, which was held recently at Berne, the Swiss Federal Council was asked to invite the interested governments to discuss whether or not they would be disposed to favor the formation of an international commission whose duties should be to establish conditions and requirements that a continuous brake should fulfil for service on freight trains, as well as the tests that should be conducted in order to determine the type of brake that would acceptably meet these conditions. The Federal Council has acceded to the request; every country, with one exception, has accepted the invitation, and some have even gone so far as to appoint their delegates. The situation has been communicated to the several governments, and Tuesday, September 22, has been fixed as the date for the meeting of the commission at Berne.

ATCHAFALAYA RIVER BRIDGE OF THE SOUTHERN PACIFIC.

Morgan's Louisiana & Texas Railroad & Steamship Co., which is a subsidiary of the Southern Pacific, has about completed a new steel bridge across the Atchafalaya river in Louisiana. Because of its size and the unusual conditions of its construction, this is of more than ordinary engineering interest.

The Atchafalaya, perhaps more often referred to as Berwick Bay, gets the bulk of its water from the Mississippi and Red

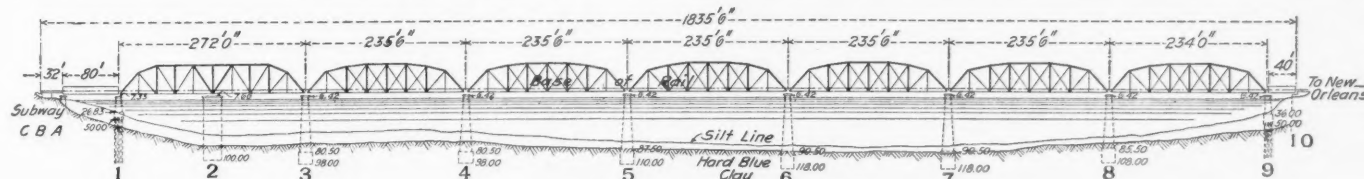
and traffic over the bridge is heavy. The water channel is a busy one, requiring frequent movement of the swing span. This would have been a serious impediment to building the new bridge on the site of the present structure. Furthermore, the time which the War Department will allow this channel to be closed to navigation is only 48 hours. It was therefore decided to build the new structure parallel with the old, and 50 ft. down stream, leaving the old bridge in service during the construction of the new. The new bridge will be 1,800 ft.



Location of Old and New Bridges.

long. It will consist of one swing span 270 ft. long, six 235-ft. fixed spans, and two plate girder spans, 80 and 40 ft. long, respectively. The spans are all pin-connected through trusses of the Pratt type, with curved upper chord, and were designed and built according to the common standard specifications of the Harriman Lines. The swing span will be operated by electricity.

The substructure consists of 11 concrete piers and two abutments. The abutments and two of the piers are either on shore or in shallow water, and did not call for anything out of the ordinary in the way of construction. The other piers were all built with caissons under air-pressure. All the substructure, except the bridge seats, which were cut from granite



New Atchafalaya River Bridge.

quarried at Granite Mountain, Texas, is concrete. The specifications for the concrete work called for a 1:2:6 mixture, the aggregate being both stone and gravel. The use of the stone was soon discontinued, however, on account of the long distance it had to be hauled and inability to get prompt delivery; gravel was, therefore, used for most of the work, a first class graded article being obtained from Profit's Island, near Baton Rouge, La. "Red Wing" Portland cement was used throughout, and the mixing was done with a No. 2 Smith mixer.

The caissons for the piers are 20 ft. x 36 ft., and have a head room of 7 ft. between under side of deck and cutting edge. The deck and sides of the caisson are 3 ft. thick, and the upper crib is 12 in. thick, all being of native pine, thoroughly braced in the usual way and made as nearly water-

For the greater part of the width of the river, the water is 75 ft. deep. The current is, as has been noted, quite swift,

quarried at Granite Mountain, Texas, is concrete. The specifications for the concrete work called for a 1:2:6 mixture, the aggregate being both stone and gravel. The use of the stone was soon discontinued, however, on account of the long distance it had to be hauled and inability to get prompt delivery; gravel was, therefore, used for most of the work, a first class graded article being obtained from Profit's Island, near Baton Rouge, La. "Red Wing" Portland cement was used throughout, and the mixing was done with a No. 2 Smith mixer.

tight as possible. The main shaft, 3 ft. 6 in. in diameter, and the supply shaft, 2 ft. in diameter, are both of boiler steel. The caisson men were conveyed to and from the caisson in a steel cage. Gangs of ten men were worked in the caissons, each working four hours in the 24, in two shifts of two hours each. The periods were gradually decreased as the pressure was increased, until, at a pressure of 44 lbs., the men were given two one-hour periods in 24 hours.

The caissons and cribs were built in the material yard on the Berwick Station side of the stream, and after the caisson and about 20 ft. of the crib were completed, the structure was lowered into the water and towed into position by a tug, a dock of guide piles having been driven to mark the position of the pier and keep it in place while it was being sunk. The cutting edge was landed on the bed of the stream after concrete to a depth of 40 ft. had been deposited.

The main plant used in building the piers was on a large barge and consisted of the pressure plant, with a battery of three boilers; two duplex air compressors with a capacity of 400 cu. ft. of air per minute each; two steam pumps, which furnished the water for jetting; an electric light plant, and a hoisting engine for handling the material and the cage in which the caisson men were conveyed to and from the caisson. In addition to the main plant, a dozen other barges were also in service. Two of these were equipped with steam hoists, on another was the concrete mixing plant, and on a fourth were quarters for the caisson and other men. The other barges were used for handling material from shore. A steam tug was used to handle the barges. The work was continued night and day during the sinking of the caissons. All the excavated material was handled through a discharge pipe by air pressure, and the progress of sinking ranged from 6 in. to 2 ft. in 24 hours.

The forms for the upper portion of the piers were only 17 ft. high, as the piers project only about 5 ft. above the surface of water. The cofferdam and crib work were re-

moved, after completion, to the depth of the bottoms of these forms.

The entire substructure was built by the Missouri Valley Bridge & Iron Co., Leavenworth, Kan., with its own plant. From beginning to completion there was no delay of any consequence, nor was there a serious accident. No serious obstructions were encountered in sinking the piers and the work was finished within the contract time. All the fixed spans have been placed on the piers and the swing span is



Two Spans in Position; Old Bridge in Background.

now erected on the falsework and ready to be transferred to its position on the pivot pier.

The erection of the superstructure was as follows: A pile trestle dock was driven at the edge of the water adjacent to a track from which all the structural steel was handled. Each span was assembled on this dock. Two barges were then moved into pockets left in the dock for the purpose. After the barges were lowered into the water by opening valves, they were floated into position under the span. Crib work was interposed between the decks of the barges and



Barge Ready to be Floated Under Draw Span.

the span, and a steam siphon then used to pump the water from the barges, lifting the span off the falsework in readiness for towing to its final position at the bridge site, a distance which averaged 1,500 ft. These barges were 24 ft. wide, 110 ft. long and 6 ft. deep. A timber crib was built on top of the decking of the barges properly to distribute the load. After towing the barges to the bridge site, and bringing the span to proper position over the piers, the barges were sunk from under by opening the valves and the span lowered to the wall plates. Two stern wheel steamboats of the Mississippi river type and a small tug were used in towing the spans. The superstructure was erected by the railroad company's own bridge forces.

The accompanying photographs show a span on falsework in course of erection, and the draw span on falsework completed and ready to be moved. This span will not be placed



Erection of Span on Temporary Pier.

in position until the deck of the rest of the bridge is finished and track connections with the new line are complete and ready for operation. A third view shows two spans in place and gives an idea of the general appearance of the bridge.

This bridge was designed under the direction of John D. Isaacs, Consulting Engineer of the Harriman Lines, and erected under the supervision of D. K. Colburn, Bridge Engineer of the railroad company.

INDIANA COMMISSION ON CAUSES AND REMEDIES FOR RAILROAD ACCIDENTS.

The Railroad Commission of Indiana, whose quarterly accident bulletins have attracted attention throughout the country because of the sharpness with which they distinguish between accidents for which the railroads are responsible and those for which they are not responsible, continues in Bulletin No. 4 for April, May and June, 1908, and in a circular letter to the press of the state under date of July 28, vigorously to call attention to the need for action by both railroads and the public, especially the latter, to stop accidents that are easily preventable. In its circular letter to the press the Commission says:

"The Railroad Commission of Indiana respectfully requests your cooperation in advising and warning the people of the state of the great

danger of going upon or crossing over highway grade crossings. We enclose you our Accident Bulletin No. 4, which will give you full information on this subject. We will be greatly obliged if you will mail us a copy of your paper, showing what you write on this important subject."

In Bulletin No. 4 the Commission says in part:

"No passengers, either on steam or interurban railroads, were killed in Indiana for the quarter ending June 30, 1908. This result we desire to emphasize by the following comparative statement:

Passengers—Fatal Accidents.					
	1st Qr.	2d Qr.	3d Qr.	4th Qr.	Total.
Steam railroads	6	3	1	..	10
Electric railroads	2	2	1	..	5
					15

"It is but just when we can present such a showing to commend this good railroading, and to commend the officers and men operating railroads in this state to whose care and efficiency this result is due. The Indiana Railroad Commission does not hesitate to accord this credit, and begs leave also in congratulating railroad men on this result and in commending them to the public to call attention to the fact that we commenced our supervising and inspecting work of the physical roads one year ago, that during the first quarter eight passengers were killed, the second five, the third two and that now we are happy in making up the record, to write it clear of fatal accidents to passengers for the entire quarter. So far as we are entitled to do so, we wish to share, ourselves and our inspectors, in the credit for these gratifying results.

"As to employees, so far as the electric railroads are concerned, we can present as good a showing. Indeed, no employee has been killed on the interurban railroads for two quarters, six months. It is deplorable that a better showing on the steam railroads cannot be made for those men whose care and efficiency, as we have just pointed out, has so greatly provided for the safety of passengers for the last three months. The statement is:

Employees—Fatal Accidents.					
	1st Qr.	2d Qr.	3d Qr.	4th Qr.	Total.
Steam railroads	29	29	23	24	105
Electric railroads	2	3	..	..	5
					110

"We have just carefully examined, with the aid of our inspectors, the accident reports of fatal injuries to employees. 'Stepping in front of switch engine,' 'Leaning out of cab,' 'Run over by engine,' 'Falling between cars,' 'Caught between cars,' 'Thrown under train,' 'Falling from engine,' 'Collision,' 'Derailment'; the same causes that have taken off so many men. We have the same caution to always urge of the greatest possible care to prevent these accidents. And especially it strikes our attention as to the number of men hurt or killed by falling from trains. Two brakemen were killed during the quarter by falling from the pilot of road engines. The practice is not permitted by the Pennsylvania, and perhaps some of the other roads, of the brakeman going out of the cab window to the pilot in order to throw the switch. The application of the air is liable at any time to make a sudden jolt that might throw a man either from the engine or the top of cars. We think that rules and bulletins should be strict on this subject, and that men should exercise the greatest care in moving at exposed points on or about the trains when they are in motion.

Travelers on Highways—Fatal Accidents.					
	1st Qr.	2d Qr.	3d Qr.	4th Qr.	Total.
Steam railroads	28	15	11	16	70
Electric railroads	3	7	5	8	23
					93

"There is no cause for congratulation in this showing. Here is where we are all to blame; here is a condition involving an unnecessary and continuous loss of life in a highly civilized country. Denounced recently by the Indiana Railroad Commission as 'the great American crime,' the aptness of the definition has met with instant recognition in the public press, and it is to be hoped in the public conscience. Separation of the grades is the only adequate remedy. It

is to be noted that practical, progressive work on this line has been undertaken by five railroad commissions, and that formal presentation of this matter will be provided and made to the next general assemblies of many states. To the wisdom of these legislatures, aided by full information now being compiled, will be submitted:

"First—That no more grade crossings shall be constructed. How is it possible to eliminate grade crossings if new railroads and highways make one or more new grade crossings for each one that is separated?

"Second—Elimination of present grade crossings; so many to each 100 miles of each railroad each year. The companies and the state, county or city to pay such proportion of the cost as has been found best and practical in the legislation of other states and as the general assemblies may determine to be right. This will be, of course, the work of more than one generation, but it should be commenced now, so that at some time all grades will be separated, and, besides, every grade crossing taken away means one or more lives saved."

"In this connection we desire to praise the Big Four Railway for taking out 23 crossings and putting in concrete bridges and subways instead, in the reconstruction work done by them between Indianapolis and Terre Haute.

"Meanwhile, while grades are being separated all other proper steps to protect lives, especially at dangerous crossings, should be taken. We mention again that in every county in this state the county as well as the city newspapers should warn the people of the great danger of highway crossings at the present rate of speed of the railroad cars and trains. These companies have nearly all adopted our recommendation for warning signals. And we trust that they will soon appear at every crossing in the state and that the word 'Danger,' in red, will be impressed on the minds of the people so that they will not attempt to cross the railroads without the most painstaking examination. Indeed, we think that where there is more than one traveler in a vehicle or vehicles that it would be best for one of them, in most cases, to alight and to walk to the track and give a signal to come on if there is no train approaching.

"Attention is called also to a novel and important action of this commission in this behalf. Proceedings have been commenced in one of the southern counties to lay out a highway across two parallel railroads. There is a highway crossing within 100 ft. of the proposed new crossing, and the new highway instead of crossing the railroads at right angle was laid at such an angle that it occupied these railroads and their rights of way for 1,000 ft. Obviously such a crossing was dangerous and unnecessary, inasmuch as the old crossing could be used. The commission, when on appeal this proceeding had reached the circuit court, presented to that court its petition praying that inasmuch as it was charged with supervising the manner in which railroads were operated with reference to the security of the public and employees it should be allowed to become a party to this case to object to such a dangerous crossing. The commission filed a brief and made an oral argument and the court allowed the intervening petition to be filed. We think if, under existing statutes, the commission cannot intervene in cases of this kind for the protection of the public its powers should be enlarged.

Trespassers—Deaths.					
	1st Qr.	2d Qr.	3d Qr.	4th Qr.	Total.
Steam railroads	36	38	39	48	161
Electric railroads	3	3	3	4	13
					174

"Observing our custom of discriminating sharply between accidents for which railroad companies are responsible and those for which they are not, it will be noted that in our statement above we have left out the word 'Accident,' and have substituted 'Deaths.' Often, in fact, these casualties look like *suicide*, and always there is a consciousness when considering them, that there are no adequate laws to prevent trespassing and the consequent loss of life, and that there is a curious apathy, if not hostility, on the part of some police officers to prevent trespassing. To illustrate what a large percentage of the casualties on railroads occur from grade crossing killings and from trespassing, it will be noted that the

death list increased this quarter only on account of highway crossings and trespassing. On the steam railroads the total death list last quarter was 74, while this quarter it is 88; but of the 14 in excess, 9 were trespassers and 5 were killed on the highway, so that these causes account for the increase. And on the electric railroads there were 3 more fatalities altogether than last quarter, but there were 8 highway killings this quarter against 5 last quarter, and 4 trespassers killed this quarter against 3 last quarter, so that leaving out deaths on highway crossings and of trespassers, there would have been a decrease instead of an increase.

The following table shows the deaths and injuries on Indiana railroads for each quarter and for the fiscal year ended June 30, 1908:

	1st Qr.	2d Qr.	3d Qr.	4th Qr.	Totals for year.
Passengers—					
Deaths	6	3	1	..	10
Loss of limbs .....	..	1	1	..	2
Spinal injury, fractures or dislocations and sprains	11	12	8	7	38
Cuts and bruises and miscellaneous	54	60	14	35	163
Travelers on highways—					
Deaths	28	15	11	16	70
Loss of limbs	1	..	1	..	2
Loss of fingers or toes .....	..	1	..	..	1
Spinal injuries, fractures or dislocations and sprains	4	3	1	5	13
Cuts and bruises and miscellaneous	11	14	10	20	55
Employees—					
Deaths	29	29	23	24	105
Loss of limbs	6	8	9	2	25
Loss of fingers or toes	4	10	1	2	17
Spinal injuries, fractures or dislocations and sprains	81	96	75	63	315
Cuts and bruises and miscellaneous	169	167	145	147	628
Trespassers—					
Deaths	36	38	39	48	161
Loss of limbs	12	10	9	11	42
Loss of fingers or toes	1	2	1	1	5
Spinal injuries, fractures or dislocations and sprains	1	8	8	11	28
Cuts and bruises and miscellaneous	10	21	24	17	72

The following table shows the total casualties on all steam roads for the year:

	Deaths.	Injured.
Passengers	10	203
Travelers on highways	70	72
Employees	105	985
Trespassers	161	147
Total	346	1,407

"For the four quarters, the year ending June 30, 1908, the showing is gruesome enough—deaths, 391. But there are some signs of encouragement. For the corresponding time a year ago, there were killed in this state 58 passengers, this year 15 passengers. And the totals have decreased, namely, 412 last year, 391 this year. But, sad to say, there is an increase in the death of employees. This should invite our closest and most careful attention. And, of course, there is an increase in the fatal accidents to travelers on the highways, as there will always be until the grades are separated; and there is an increase in the death list of trespassers, as there always will be until they are kept from going to their deaths by trespassing on the railroad tracks."

Aug. 7 of last year a German express train ran off the track near Trernessen at a point where workmen were reconstructing the track. A number of train and road employees were tried before a court which decided the case last June. An acting roadmaster who had charge of this work had gone home for the night, and left the work in charge of a gang foreman, contrary to instructions. He was sentenced to eight months in prison. A trackman had removed three bolts from the rails, and the gang foreman permitted this, though a track watchman cautioned him that in such work not more than two might be taken out, the foreman retorting: "You have nothing to say; if I decide to take out three, three it is." Another road guard also remarked that the condition in which the track was left was dangerous, eliciting the answer, "O, that will hold." This gang foreman goes to jail for three months; the trackman who took out the bolts, for two weeks. All trainmen were acquitted.

FIVE YEARS OF RAILROAD REGULATION BY THE STATES.*

BY GROVER G. HUEBNER,

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In 1902, the Interstate Commerce Commission, in an exhaustive report, tabulated the laws which the state legislatures for 20 years past, had enacted for the control of their common carriers. Since then, five legislative years have passed, and at no other time of equal length in the history of state railroad control, have the commonwealth legislatures enacted more railroad laws than during the last half of this period. In half a decade, over 800 separate provisions were enacted to regulate the common carriers engaged in intrastate traffic.

For purposes of analysis, the chief provisions may be classified into six groups: (1) The newly created commissions; (2) Amendments to older commission laws; (3) Freight rate and passenger fare acts; (4) Acts designed to regulate the service of public carriers; (5) Corporate affairs, and (6) Public safety.

NEWLY CREATED COMMISSIONS.

While in 1902 there were 31 State¹ railroad commissions, at present there are 39. As seven of the old commissions,² however, were displaced by bodies vitally different, it is permissible to say that during the last five years 15 new commissions were created.

For purposes of comparison, these newly created commissions may be divided into four groups. First, and most numerous, are those whose rate fixing authority consists of the power to revise rates as distinct from the power to make complete schedules. The commissions of Wisconsin, Ohio, Colorado, Michigan, Nevada, New York, Oregon, and Vermont, are of this type. In these states, the work of making the complete schedule of rates for the intrastate traffic remains in the hands of the railroad traffic agents. If, however, a shipper, an agricultural, trade or manufacturing organization, a municipality or other corporation, as designated in the various statutes, makes a complaint to the commission that a particular rate or specified rates are unjustly high or discriminatory, the commission investigates the matter, calls witnesses, has experts examine the railroad's accounts and holds formal hearings. If it finds the complaint well-founded, it orders the railroad to substitute, for the particular rate complained of, rates which the commission considers reasonable. Commissions of this type may issue mandatory orders³ only upon complaint, and after hearings have been held, they may investigate any rate upon their own initiative, but in that case may merely recommend. Their duty is not to make schedule of rates, but to correct whatever flaws may be found on the schedules as made by the railroads.

TABLE I.—Organization and Scope of the Commissions.

State.	Year.	How chosen.	Term years.	No.	Power to fix rates.	Classification.	Joint or private rates.	Express or private cars.	Industrial R. R's.
Indiana .1905.	App.	4	3	Yes.	Yes.	Yes.	Yes.	Yes.	....
Wash. .1905.	App.	6	3	Yes.	Yes.	Yes.	Yes.	Yes.	....
Wisconsin.1905.	App.	6	3	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
Ohio. .1906.	App.	6	3	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
Colorado .1907.	Elec.	6	3	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
Mich. .1907.	App.	6	3	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
Montana .1907.	Elec.	4	3	Yes.	Yes.	Yes.	Yes.	Yes.	....
Nebraska.1907.	Elec.	6	3	Yes.	Yes.	Yes.	Yes.	Yes.	....
Nevada .1907.	App.	3	3	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
New York.1907.	App.	5	5 & 5	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
Oregon .1907.	Elec.	4	3	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
N. Jersey.1907.	App.	6	3	No.	No.	No.	....	....	....
Penn. .1907.	App.	5	3	No.	No.	No.	Yes.	....	....
Alabama .1907.	Elec.	4	3	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
Vermont .1907.	App.	6	3	Yes.	....	....	Yes.	Yes.	Yes.

*This applies to express cars only.

The second type of the newly-created commissions includes

*From a paper in the *Annals of the American Academy of Political and Social Science*. Extract reprinted by kind permission.

¹Including Virginia Corporation Commission, created by constitution in 1902, but not appointed until 1903.

²The commissions of Wisconsin, Ohio, Colorado and Michigan consisted of but one commissioner; those of New York, Alabama and Vermont were displaced by new commissions.

³Wisconsin commission may investigate, call hearings and issue orders upon its own motion.

those which have the power to make complete rate schedules for all purely state traffic. Washington, Indiana, Montana, Nebraska and Alabama have granted this power to their respective commissions and made it their duty. In making the initial rate schedules these commissions exercise far more drastic powers than those of the first type, for they act upon their own initiative and make schedules instead of corrections. After their schedules are inaugurated, complaints may be brought, as in the case of the commissions which merely revise rates, and the railroads may likewise make complaints. The order of procedure is then similar to that above explained, with the one marked difference, i.e., the complaint in the eight states of the first type, is usually against rates made by the railroad freight agent, while in these states, it is against rates made by the commission.

The third type consists of the so-called "weak commissions,"—those which do not have the power to fix rates. In 1902, 10, or one-third of the state commissions were still of this character, but of the 15 newly-created commissions, but two, those of Pennsylvania and New Jersey, are "weak." The Pennsylvania commission investigates rates, makes its findings public and recommends certain charges to the carriers. If its recommendations are not voluntarily accepted, the commission has no mandatory power; it brings the matter before the Secretary of Internal Affairs, and the Attorney-General, "for their action according to law, as the public interests may require," and reports the same in detail in its next succeeding report to the governor.⁴ The New Jersey Commission of 1907,⁵ likewise, can merely investigate and recommend as regards rates and the other important matters of railroad operation; it can issue orders only as regards the safety of tracks, roadbeds, tunnels, bridges and equipment, and the adequacy of transportation facilities and stations.

The last group of commissions forms a distinct type, not because of their rate-making power, but, because of the scope of their jurisdiction. They are "Public Utility Commissions," and include those of New York and Wisconsin.⁶ In addition to the usual common carriers, controlled by railroad commissions, the New York Public Service Commission has jurisdiction over all street railways, and over the manufacture, sale and distribution of gas and electricity for light, heat and power.⁷ The state is divided into two districts and in each there is a public utility commission consisting of five members. The Wisconsin Railroad Commission was, in 1907, given jurisdiction over an even wider range of public utilities. In addition to common carriers, street car and telegraph companies, telephone companies and light, heat, water and power plants were placed within its jurisdiction.

In the four types of commissions here distinguished, there are certain common powers and tendencies clearly discernable. The powers of greatest importance are those with respect to rates. There is a decided tendency in the direction of granting to the commissions the authority to make rates, 13 of the new commissions being armed with rate-making powers. The particular form of this rate-making power manifests a tendency toward rate revision as contrasted with the making of schedules, eight of the commissions having the former, and five the latter authority. The tendency, moreover, is toward the fixing of absolute rates, but two of the commissions, those of Montana and New York, being definitely limited to the making of maximum rates.⁸ Lastly, the tendency in rate-fixing is to make it all inclusive. Twelve of the 13 mandatory commission laws expressly include the power to fix joint rates and classifications.⁹

A second marked tendency is to give to the commissions wide administrative powers over the service of common car-

⁴ Pennsylvania, Act of May, 1907, No. 250, Sec. 17.

⁵ New Jersey, Laws of 1907, Ch. 197.

⁶ Wisconsin Railroad Commission (1905) obtained charge of public utilities in 1907, Sec. 1797, M 1 to 108.

⁷ Laws of New York, Ch. 429.

⁸ Laws of Montana, 1907, Sec. 13; Laws of New York, Ch. 429.

⁹ See Table I.

riers. Each of the 15 recently created commissions is entrusted with the important duty of supervising the distribution of cars, and all but the Pennsylvania commission may issue mandatory orders to provide for reasonable distribution. Train service, stations and terminals, and, as is stated in the typical Wisconsin statute, "any regulation or practice, whatsoever, affecting the transportation of persons or property" are controlled by the commissions in the same way as are rates.

A third group of powers generally vested in the new commissions is the control¹⁰ of matters pertaining to public safety. They supervise the trackage and roadbed, grade crossings, signals, interlocking plants and all other safety devices, and issue orders, when necessary for the safety of the public or the railroad employees.

The fourth tendency is to grant financial powers to the commissions. In New York, Wisconsin, Washington and Oregon, the commissions have the power to prescribe a system of uniform accounts, with the injunction in the New York statute, that it "shall conform as near as may be to those from time to time, established and prescribed by the Interstate Commerce Commission."¹¹ In New York, Oregon and Vermont, the commissions have control over the issue of stocks and bonds. All of them have the power to investigate the financial condition of all carriers within their jurisdiction.

The judicial and executive powers of the new commissions consist chiefly of the power¹² to try cases, hear and investigate complaints, summon and examine witnesses, issue subpoenas, administer oaths, require the production of books and papers, take depositions, "make findings, decisions or recommendations, determine their own procedure, and use a seal."

In the sixth place, there is a marked tendency to increase and concretely define the extent of the commission's jurisdiction. As was true of the older commissions, all the newer statutes grant to them the control over common carriers. But the recent¹³ statutes stipulate what is included under the term "common carrier." Fourteen of the 15 laws definitely include express companies;¹⁴ 13 especially stipulate private car companies and fast freight lines; and nine make special mention of industrial railroads. In 12 of the new commission laws, special mention is made of interurban street railways;¹⁵ and in Indiana, Nebraska, New York, Wisconsin and Pennsylvania, their jurisdiction extends to street railways¹⁶ operating within cities. The Pennsylvania Commission, furthermore, has jurisdiction over navigation companies, pipe lines, and telegraph and telephone companies.

In New York and Wisconsin, this tendency is carried to the extent of giving the commissions charge of most public utilities. The Georgia commission was, in 1907, reorganized so as to approach closely the scope of a public utilities commission, and similar attempts, in 1908, were made in Ohio and New Jersey. Shortly before the beginning of the five years here under consideration, this tendency was given its start in the "Corporation Commissions"^{17a} of Virginia and North Carolina.

Lastly, there are definite tendencies in the organization of the new commissions. The movement is away from the single commissioner to a commission of three or more. Fourteen of the commissions consist of three members, and New York's statute provides for two commissions, each consisting of five members. The movement is also toward a long tenure of office,¹⁷ eight of the statutes providing for a six-year term, two for five years, four prescribe a four-year term, and but one clings to a term of three years. Contrary to what the

tendency was in 1902, ten of the new commissions are appointive and five elective.

In all the new commission statutes there are provisions designed to make effective the work of the commissions. A penalty ranging from a maximum of not over \$500 for each offense in Washington and Montana, to one of from \$100 to \$10,000 for each offense, assessable against the railroad and its agents and employees, in Wisconsin, Ohio, Nevada and Oregon is provided for in case an order of the commission is violated. In Michigan the penalty is \$500 per week; in New York it is not over \$5,000 per day. Eleven of the commission statutes compel the carriers to publish their rates and file them with the commissions;¹⁸ eight expressly state that none but published rates are lawful; and 11 provide that no rate may be changed without a notice of from 10 to 30 days. Twelve provide for stringent penalties against unjust discriminations and secret rebates. All the statutes creating "strong" commissions have provisions with reference to court appeals. Ten¹⁹ of them provide that in case of appeal the orders of the commission shall be *prima facie* reasonable, and that the burden of proof shall be upon the carrier; all the laws, except that of New York, provide for a notice and hearings before their orders are suspended by injunction; the Colorado law specifies that the commission's order may not be temporarily suspended for more than 90 days; in Montana and Nevada, the commission's orders remain in force during the court appeal; in Alabama, Oregon, Washington and Indiana, a bond must be posted by the carrier before an order may be suspended so as to test its validity in a court; and in New York, the carriers may appeal only on constitutional grounds of confiscation of property without due process of law.

AMENDMENTS TO OLDER COMMISSION LAWS.

In addition to the creation of new commissions, many changes were made in the powers, duties and organization of commissions which had been previously established. Contrary to the tendency toward the appointive commission, above noted, two of the older commissions, those of Kansas²⁰ and Georgia, were changed from the appointive to the elective type, and in the case of the former, the term of office was reduced from three to two years. In other respects, however, the amendments have been largely in conformity with established movements.

The term of office in Iowa²¹ was increased from three to four years, the salaries of the commissioners in Massachusetts²² and Kentucky were advanced, and the Georgia commission was enlarged to a membership of five. In five states the scope²³ of the commissions was increased. Steamships were brought within the Massachusetts statute; express companies within that of Iowa; sleeping car companies within that of Arkansas; electric railways, express and sleeping car companies were brought within the jurisdiction of the Kansas commission, and pipe lines within that of the Louisiana commission.

The Georgia commission was changed into a public utilities commission when it was given jurisdiction over street railways, telegraph and telephone companies operating beyond the limits of a city, town or country, over public docks and wharves, terminals and terminal stations, public gas light and electric light and power companies.

The Texas, Maine and Kansas commissions were given control over sidetracks,²⁴ and spurs; those of Virginia and North Carolina, over demurrage and car service;²⁵ Georgia²⁶ over the forwarding of freight; Missouri,²⁷ over train service, and North

¹⁰ Not mandatory in Pennsylvania.

¹¹ Laws of New York (1907), Ch. 429, Sec. 52.

¹² Proceedings of Eighteenth Annual Convention of National Association of Railway Commissioners, p. 157.

¹³ The New Jersey statute, 1907, Ch. 197, is indefinite in this respect.

¹⁴ See Table I.

¹⁵ In all but Washington, Montana and New Jersey.

¹⁶ Vermont statute extends to "all railroads within this state, whether operated by steam, electricity or any other power."

^{17a} The Oklahoma constitution provides for a corporation commission, but it is not yet created.

¹⁷ See Table I.

¹⁸ See Table I.

¹⁹ Indiana, Washington, Wisconsin, Ohio, Michigan, Montana, Nebraska, Nevada, Oregon, Alabama.

²⁰ Kansas, 1903, Ch. 391; Georgia, 1906, p. 100.

²¹ Iowa, 1906, C. 38.

²² Massachusetts, 1906, C. 417, from \$5,000 to \$6,000; Kentucky, 1906, C. 85, from \$2,000 to \$3,000 and \$3,600.

²³ Massachusetts, 1903, C. 173; Iowa, 1907; Arkansas, 1907, Act 193; Kansas 1907; Louisiana, 1906, No. 86.

²⁴ Texas, 1903, C. 99; Maine, 1907; Kansas, 1905, C. 351.

²⁵ Virginia, 1903, C. 260; North Carolina, 1903, C. 342.

²⁶ Georgia, 1905, p. 120.

²⁷ Missouri, 1905, p. 104, 108.

Carolina, South Carolina and Kansas over stations.²⁸ Many commissions were given control over public safety devices,²⁹ and in four³⁰ states laws were passed obliging carriers to report all accidents to the commissions. The Alabama and Missouri commissions³¹ were, in 1903, changed from the "weak" to the "strong" type. The Iowa and Arkansas commissions were given the power to fix joint rates. The Virginia³² commission was, in 1906, burdened with the duty of making a schedule of passenger fares; and in 1907 the South Dakota commission³³ was instructed to determine the value of the intrastate railroads with a view to making a rate schedule.

Finally, three of the older commissions were given greater financial powers. The New Hampshire³⁴ commission was given the same control over the stocks of a holding company as it previously had over railroad stock issues; the Georgia³⁵ commission was given control over the issue of stocks and bonds, and the Minnesota³⁶ commission was given the highly important power of fixing a uniform system of accounts.

FREIGHT RATE AND PASSENGER FARE ACTS.

There is a well-defined difference in railroad legislation, between regulation through a commission and regulation by statute. Many statutes, enacted during the last five years were intended primarily as aids to the commissions, and in statutes of this type there is nothing anomalous. Seventeen states enacted laws prohibiting unjust discriminations and rebates. Those passed since the enactment of the Elkins' Law of 1903, and the Interstate Commerce Act of 1906, are modeled after the Federal statutes, and usually provide that the penalty is assessable with equal force against the shipper who accepts a rebate and the carrier who pays it. Ten states, likewise, passed statutes, doubtless based upon the federal acts, providing that only the published rates are lawful. A conviction of rebating in these states, therefore, does not necessitate the comparison of rates paid by competing shippers, but merely evidence that the actual rate paid was different from the published rate. Similarly, provision was made in a dozen states that no rate may be changed without notice of a specified number of days—ten days in eight states and 30 days in four.

A similar group of statutes consists of the so-called anti-pass laws. Fourteen states, Alabama, Iowa, Kansas, Minnesota, Michigan, Nebraska, Oregon, Texas, Vermont, Ohio, Indiana, South Dakota, Oklahoma and New York, enacted provisions much like those in the Hepburn Act, prohibiting the granting of all passes, except to railroad officials, agents, employees and their families and certain other persons specifically excepted. Six states, Georgia, Wisconsin, New Hampshire, South Carolina, Nevada and West Virginia, prohibited the giving of passes to certain public officials, or members of the judiciary, in order to eliminate bribery, and Texas and Iowa enacted similar anti-pass provisions before the adoption of the more sweeping statutes. New Jersey, in 1907, attempted to accomplish this same end by compelling the railroads to grant free transportation to a large number of public officials, and a similar provision, embodied in a constitutional amendment, was submitted to the voters of Missouri, but was rejected.

Rate statutes of this type are but complementary to the control of rates through a commission. In many states, however, the legislatures fixed maximum freight rates and passenger fares by statute, and thereby violated the saner principle of rate control through expert commissions, which they

apparently accepted when they vested such commissions with rate-making powers. It is a curious fact that, side by side with the creation of 15 new commissions and the granting of increased powers to many of the older commissioners, 22 states, during the last five years, enacted statutes fixing the maximum passenger fare which may be charged between points within their boundaries. Eleven³⁷ state legislatures fixed the arbitrary maximum fare of 2 cents per mile; the statutory maximum in Iowa and Michigan is graded from 2 to 3 cents; that of Virginia, from 2 to 3½ cents; that of Alabama and North Dakota is fixed at 2½ cents; North Carolina, at 2¼, and that of Kansas, Montana, South Carolina and Washington at 3 cents per mile.

Before the Wisconsin two-cent fare law was enacted, the railroad commission made a careful examination of the passenger fares of the state, and declared itself in favor of a maximum no lower than two and one-half cents per mile, but the legislature disregarded the expert opinion of the commission and fixed an arbitrary maximum at two cents for all railroads with receipts of \$3,500 or over per mile. In this the railroads of Wisconsin acquiesced, but in other states, notably Pennsylvania, Alabama, Mississippi, Nebraska and North Carolina, the railroads appealed to the courts.

The acts of Pennsylvania and North Carolina have already been finally declared to be unconstitutional. Whether or not the remaining maximum fare laws will likewise be overthrown, the wisdom of fixing fares by a sweeping and inflexible statute instead of through an expert commission is at least questionable.

In addition to the statutes fixing maximum fares, nine states passed laws relative to passenger mileage books. The usual provisions are that mileage books of specified amounts must be sold; that they are to be transferable; and that the rate is not to exceed a specified maximum per mile.

The number of statutes enacted during the last five years, fixing maximum freight rates, is insignificant in comparison with those fixing maximum fares. Nine states, however, adopted such laws. The Alabama rate law of 1907, after dividing railroads into four classes, divides the bulk of intrastate traffic into twenty-two classes. It then prescribes a maximum rate for each class, above which neither the railroad commission nor the railroad may fix an actual rate. Separate maximum schedules are, also, prescribed for cottonseed oil, oil cake, cottonseed, ashes and fertilizers. Minnesota in the same year enacted the well known freight rate act, recently declared unconstitutional by the United States Supreme Court. Many of the chief commodities which had previously paid commodity rates were by statute placed within the Minnesota classification, and each class was given a maximum rate. Practically all agricultural products, lumber and live stock, the highly important factors of Minnesota freight, were in this way divided into statutory classes and deprived of commodity rates.

In Nevada the identical rate law which creates the rate-making commission fixes a complete maximum schedule of rates for both classified and unclassified traffic, and adopts the western classification. A Nebraska statute of 1907, prescribes maximum rates for live stock, potatoes, grain and grain products, fruit, coal, lumber and building material in carload lots. A Kansas rate law of 1905 prescribed schedules for oil, gasoline, fuel oil and petroleum, and two years later similar schedules were fixed for cereals and cereal products. In 1905 the Missouri legislature fixed maximum rates for six classes of freight in carload lots, as well as for stone, crushed rock, sand and brick in carload lots; and in 1907, it raised all these maximum rates and prescribed maximum rates and carload weights for fruit. Similar, though less comprehensive, rate statutes were enacted in North Carolina, South Carolina, Maryland and North Dakota.

²⁸ North Carolina, 1903, C. 126; South Carolina, 1906, C. 8; Kansas, 1907, C. 267.

²⁹ New Hampshire, 1903, C. 88; Minnesota, 1905, C. 176, 1907; Massachusetts, 1906, C. 417; Illinois, 1905, C. 350.

³⁰ South Carolina, C. 419; Minnesota, 1905, C. 122; Iowa, 1905, C. 131; North Dakota, 1907, C. 205.

³¹ Alabama, 1903, p. 95; Missouri, 1903, p. 132.

³² Virginia, 1906, C. 256.

³³ South Dakota, 1907, C. 213.

³⁴ New Hampshire, 1903, C. 55.

³⁵ Georgia, 1907, No. 223.

³⁶ Minnesota, 1907.

³⁷ The Missouri and Mississippi 2-cent fare not applicable to very small roads.

STATUTES REGULATING THE SERVICE OF COMMON CARRIERS.

The car shortage during the years 1905, 1906 and part of 1907, and the frequent complaint that cars were not fairly distributed resulted in an unusually large number of statutes designed to regulate car service. Twenty-five states enacted car service laws, and in twenty of them—Alabama, Colorado, Indiana, Kansas, Minnesota, Missouri, Arkansas, Georgia, Louisiana, Mississippi, North Dakota, South Carolina, Virginia, Oklahoma, Oregon, North Carolina, South Dakota, Texas, Vermont and Washington—they provided for reciprocal demurrage. As is indicated in the following table (Table II.) the provisions of the reciprocal demurrage laws show little uniformity other than that the shipper is usually obliged to unload or load his cars within a period of 48 or 72 hours or pay a demurrage of from one to five dollars per car for each day of delay. On the side of the carrier the number of cars, the time limit, the demurrage charges, the number of miles per day which the cars must move and the time allowed for delivery are usually specified, but without uniformity in the different states. The demurrage in the more recent statutes seldom exceeds \$5 per car per day. The Texas law, which provided for a penalty of \$25 if ten cars were not furnished within six days or fifty in ten days, was declared unconstitutional,²⁷ as a burden upon interstate commerce and beyond the police power of the state.

The remainder of the car service statutes usually provide that there shall be a "reasonable and fair distribution" of cars between applicants. As was previously noted, moreover, in the fifteen states creating new commissions, as well as in Virginia and North Carolina, the supervision of car distribution was placed in the hands of the railway commissions.

A second field of service regulation is that of stations and terminals. Twenty-seven separate states enacted statutes, the usual provision of which was that adequate stations must be built when population or traffic has attained specified amounts, and that they must be suited to the convenience of the public.

²⁷ Houston & Texas Central Railway vs. Mayes, 2014, S. 321.

It is frequently stipulated that passenger stations must be open at specified times, that they must have public telephone service, must be adequately heated and lighted, and have adequate toilet facilities.

Twenty-three states enacted laws regulating train service and connections. These statutes generally stipulate that through connections shall be provided and that a reasonable number of trains shall be available in all stations. In Mississippi, Texas, North Dakota, Wisconsin, Minnesota, South Carolina, Montana and Indiana it was provided that railways shall furnish bulletins announcing the arrival and departure of passenger trains.

In 15 states, during the last five years, the live-stock service was the object of legislation. The usual provisions in the laws are that cattle shall be unloaded for food and rest at the end of a given number of hours, that stock cars shall be moved at the rate of say eighteen miles per hour²⁸ on the main line and twelve miles per hour on branch lines, and that free transportation and caboose facilities shall be provided for the attendants of live stock. The Alabama law stipulates that, in the distribution of cars, live stock shall receive preference; the Montana law declares it to be a misdemeanor for a carrier to permit cattle to be shipped without inspection; in several states new statutes were enacted relative to fences²⁹ and cattle guards; and in South Carolina carriers are required to furnish telegraphic information as to the movement of stock cars.

Twenty-one states regulated the construction and use of industrial tracks and spurs. In nine of the states creating new commissions, as well as in Maine, Texas and Kansas, control over such tracks is vested in the commissions; a California law of 1905 required the consent of the local legislative authorities before private tracks could be built; and in various states³⁰ carriers were obliged to build branch lines to a dis-

TABLE II.—RECIPROCAL DEMURRAGE ACTS (1903—1907).

State.	Shippers' Demurrage—			Carriers' Demurrage—			Delivery at destination.	Penalty, car per day.
	Free time.	Penalty, per car per day.	No. of cars.	Free time.	Penalty, per car per day.	Miles per day.		
Alabama	48—72 hrs.	\$1; total not over \$10.	3 4—9 10—25	2 days. 5 " 10 "	\$1; total not over \$10.	50	24 hrs.	\$1.00
Arkansas	48 hrs.	\$5.00	..	6 "	\$5.00	50	24 "	5.00
Colorado	48 "	1.00	..	3 "	1.00	Reasonable.	Reasonable.	Damage.
Georgia	48 "	1.00	..	4 "	1.00	50	48 hrs.	\$1.00
Indiana ¹	..	..	..	48 "	1.00	50	24 "	5.00
Kansas	48—72 hrs.	\$5.00	1—9 10—29 30 +	3 " 6 " 10 "	\$5.00	50	24 "	5.00
Louisiana	Add'l time.*	..	..	10 "	1.00	..	Reasonable.	..
Minnesota	48—72 hrs.	\$1.00	1—3 4 +	48—72 hrs. 1 day add'l.	1.00	50	24 hrs.	\$1.00
Missouri	48—72 hrs.	..	..	4 days.	1.00	60	12—24 hrs.	1.00
Mississippi	..	..	..	5 "	1.00	..	No delay by switching to side tracks.	1.00
North Carolina	..	..	..	4 days.	\$1.00	50 m—3 days 24 hours each add'l 25 m.	48 hrs.	\$25 1st day, \$5 thereafter; ½ for L. C. L.
North Dakota	..	..	2	72 hrs.	\$2.00	..	60 hrs.	Refused to accept.
Oregon	48 hrs.	\$2.00	1—5 6—10 11—29 30 +	5 days. 10 " 15 " 20 "	\$2.00	Reasonable.	Reasonable.	\$2.00
Oklahoma	..	\$1.00	..	..	1.00	60	..	1.00
South Carolina	72 hrs.	..	..	3—4	1.00	..	48 hrs.	1.00
South Dakota	Must begin loading in 48 hrs.	\$5.00	1—9 10 +	72 hrs. 6 days.	1.00	50	..	1.00
Texas. ²	48—72 hrs.	\$25.00	1—10 50 +	3 " 10 "	25.00	Reasonable.	Reasonable.	..
Vermont. ³	..	..	..	4 "	\$1,000 & dam'ges	..	..	..
Virginia	..	..	..	4 "	\$1.00	50	24 hrs.	\$1.00
Washington	48 hrs.	\$1.00	10	6 "	1.00	50	24 "	1.00

*On coal, coke, watermelons, perishable meats and export goods

¹ Penalty not imposed if there was reasonable effort.

² Unconstitutional. Act of 1907 calls for reasonable car service.

³ Penalty not imposed if failure is due to car shortage.

²⁸ Nebraska, 1905, C. 107.

²⁹ Arizona, Montana, Florida, Oklahoma, Utah, Washington, South Dakota.

³⁰ Kansas 1905, C. 350; South Carolina, 1905, C. 480; Mississippi, 1905, C. 386; Indiana, 1907; Nebraska, 1907, C. 89.

tance of from one-quarter to one-half mile from the main line unless lack of necessity could be demonstrated to the railroad commission.

Lastly, 21 states enacted statutes concerning the service of express companies. In sixteen⁴¹ of these the express service was by statute placed within the jurisdiction of their railroad commissions. The Arkansas and Florida legislatures enacted laws regulating the payment of damages by express companies; and a Nebraska statute of 1907 fixed the maximum express rates at 75 per cent. of what they were on January 1 of that year.

CORPORATE AFFAIRS.

As many as 36 states and territories enacted statutes regulating the general corporate affairs of common carriers. Corporate powers, however, were so well defined by older laws, that few of those passed during the last five years are of special importance; but few common tendencies, moreover, are discernible. Various statutes⁴² provide that electricity may be substituted for steam without obtaining a new charter; others stipulate how securities may be issued, those of Arizona, Mississippi, New York and New Hampshire being aimed directly at the issue of watered stocks and bonds. The Wisconsin statute of 1907 prohibits the issue of stock below par or of bonds at less than 75 per cent. of their par value, and provides that dividends may be paid only on shares fully paid for and only out of net profits. Still others of these corporate statutes permit the purchase of steamboats and barges by railroads.⁴³ The majority, however, make minor changes in the laws defining the corporate powers of common carriers.

PUBLIC SAFETY.

The rapid increase in railroad accidents during the last half decade was a matter of special concern to the state legislatures, and as a result statutes designed to promote public safety were enacted in 35 states and territories. Of special frequency were the laws regulating the location and operation of grade crossings, such statutes being enacted in 26 states.⁴⁴ Some place the control of grade crossings directly in the hands of the commission; some provide for specified safety devices at grade crossings; some limit the maximum percentage of the grade, and others limit the speed of the trains. In various states⁴⁵ laws were enacted dealing directly with accidents by requiring that all accidents be immediately reported to the state commission, whose duty it is to investigate whenever necessary.

In 17 states⁴⁶ and territories statutes designed largely to protect the public took the novel form of prescribing a limit to the number of hours of continuous labor permissible on the part of trainmen and telegraphers. The most frequent limit is 16 hours; but in Texas, Connecticut, Missouri, New York, Wisconsin and West Virginia it is fixed at eight hours for telegraphers; and in Texas at 14 hours for trainmen. The basis upon which these laws rest is the belief that if men who are directly concerned with the movement of trains work continuously for more than say 16 hours they are liable unknowingly to make errors which may result in vital danger to the traveling public.

⁴¹ New Hampshire, Massachusetts, Vermont, Alabama, Pennsylvania, Oregon, New York, Nevada, Nebraska, Montana, Michigan, Colorado, Ohio, Mississippi, Washington and Indiana.

⁴² California, 1905, C. 423; Nebraska, 1905, C. 40; Maryland, 1906, C. 717; Tennessee, 1903, C. 115; New Hampshire, 1903, C. 102.

⁴³ Michigan, 1905, C. 156; Massachusetts, 1904, C. 169.

⁴⁴ Vermont, Montana, North Dakota, Kansas, Indiana, Florida, New Hampshire, Ohio, Maryland, New Jersey, Michigan, Missouri, California, Massachusetts, Pennsylvania, Maine, Arkansas, New York, Illinois, Minnesota, Oregon, Alabama, West Virginia, Oklahoma, Nevada and Wisconsin.

⁴⁵ South Carolina, Minnesota, Colorado, Michigan, Montana, Nevada, New York, Pennsylvania, Massachusetts, New Hampshire and Illinois.

⁴⁶ Kansas, Missouri, Maryland, Arkansas, Iowa, North Dakota, Wisconsin, Indiana, Minnesota, South Dakota, Texas, Virginia, Connecticut, Montana, New York, North Carolina, and West Virginia.

⁴⁷ California, Delaware, Georgia, New Mexico, Oregon, Montana, North Carolina, Rhode Island, South Carolina and Vermont.

⁴⁸ Indiana, Ohio, Illinois and Missouri.

⁴⁹ Indiana, Ohio, Illinois, Missouri, Minnesota and Michigan.

⁵⁰ Virginia, Colorado and Maine.

⁵¹ California, North Carolina, and Vermont.

⁵² Indiana, Mississippi, Texas, Arkansas, Kansas, and South Dakota.

Aside from these general groups of public safety statutes, many miscellaneous provisions were enacted. Various states⁴⁷ provided for the most extreme penalties against attempts to derail trains. Some⁴⁸ enacted laws requiring power brakes for locomotives and a given percentage of the cars in a train, usually 75 per cent.; others⁴⁹ required the adoption of automatic couplers and grab irons. Various states⁵⁰ fixed heavy penalties against tampering with switches and signals; some⁵¹ prohibited the employment of men addicted to the use of liquor; others made special provision that a full train crew⁵² is at all times to be in charge of a train. A Nebraska statute fixes the minimum age of a night telegraph operator at 21 years, and a similar law in Wisconsin provides that a telegrapher must be at least 18 years of age and have had 18 months of instruction under an experienced operator. An Alabama law stipulates that employees engaged in train movements must be able to distinguish objects, colors and sounds.

GENERAL SURVEY OF THE PERIOD.

The last five years as an aggregate have been a period of almost frenzied railroad legislation, and it is not surprising that both wise and unwise statutes were, in the heat of public agitation, enacted by the state legislatures. The sanest legislation and that which is best withstanding the present reaction in public and court opinion, is doubtless that which placed the supervision of railroads into the hands of railroad commissions as distinct from direct control by sweeping and inflexible statutes. Whatever general tendencies have been developed in this commission legislation has likewise been sane and conservative.

The marked tendency to confer upon the commissions the power to fix rates, joint rates and classifications is but a recognition of the fact that in few states other than Massachusetts have commissions with merely advisory powers been able to cope with the rate situation. There is nothing inherently wrong in the rate-making power if it is of the conservative type, and, as was previously noted, eight of the thirteen newly created mandatory commissions are instructed to revise individual rates upon complaint and after hearings have been held, as contrasted with the drastic power of making rate schedules.

The tendency to vest the commissions with wide administrative powers over the service of railroads cannot but lead to better results than the rigid control of service by statute. The promotion of public safety through commissions; their supervision over stock and bond issues, and their power to investigate the finances of railroads leads to a far more conservative and elastic control than could be secured by rigid, prohibitory statutes. Even the power to promulgate uniform accounts is less drastic than it appears, for almost invariably the commission co-operates with the railway accountants. The judicial power to call witnesses, to have access to books and papers and to take sworn testimony is a vital auxiliary to state railroad regulation, for in no other way can either a commission or a court arrive at an intelligent conclusion in the issue of an order.

The tendency to increase the membership from a single commissioner to a commission of three or of ten, as in New York and five in Georgia; the increased salaries of the commissioners; longer tenure of office; the more frequent practice of having them appointed rather than elected as political office holders, and the provision for the hiring of experts—all lead to a better personnel in the commissions and a better understanding of the delicate matters which come before them.

A final tendency in commission legislation is the establishment of public utilities commissions. If railroads are to be subjected to state control because of their quasi-public nature, then there is little reason why they should be singled out from other public utilities. As was previously indicated, there is an almost universal movement to extend the scope of the commission to express, sleeping car and private car companies, industrial railroads, terminals and interurban street railways. In some it is extended to include telegraph and telephone com-

panies, navigation companies and street railways within cities and towns. In others it is extended to nearly all public utilities. North Carolina and Virginia have "Corporation Commissions," New York and Wisconsin have Public Utilities Commissions, and the Georgia Railroad Commission has jurisdiction over a large number of public service corporations.

But the legislation of the last five years has also its anomalies. It would seem that when a state entrusts the regulation of rates, fares and service to its commission, the policy of regulating these matters directly by statute would decline; but the mere bulk of statutes above enumerated is striking evidence that statutory control has increased enormously. Not all such laws are contradictory to the principle of mandatory commissions. As was previously explained, many of the statutory provisions were enacted so as to make the work of the commissions more effective, neither is there anything unusual in many of the laws concerning public safety, the corporate affairs of the railroads and other matters which are much alike in all parts of a state, and may be regulated by a blanket statute without special hardship to particular railroads.

It is the statutory fixing of rates and fares that has caused the greatest complaint, and it is these that now bear the brunt of adverse court decisions. It is notable that as long ago as 1890 there were 22 maximum rates and fares statutes, and that during the next 12 years⁵³ the number was increased by but four. During the last five years, however, 22 states enacted maximum fare laws and nine states established maximum rate schedules by statute. With few exceptions these states also have commissions to whom they have given the power to make rates and fares.

Only slightly less inexplicable is the statutory control of the railway service. In numerous instances, the self-same states that vested their commissions with the power to supervise the service of the carriers, enacted reciprocal demurrage laws to solve the car service problem, and passed rigid statutes as to the location and construction of terminals, the running of trains, the making of connections and the building of private tracks and spurs. There were grounds for state control of the railroad service, but it is questionable whether it should be in the form of statutes enacted by legislatures, or by orders issued by expert commissions.

It is not surprising that of the great number of railroad statutes recently enacted some should be contested by the carriers, and this, together with their depleted earnings as a result of the industrial depression, has caused a sudden halt in the activity of the state legislatures. It is of special significance that thus far the successful attack of the railways has been against the regulatory statutes and not against the commissions. In Washington, alone, has the court denied to the commission the power to fix maximum rates, because of a special provision in the state constitution reserving that power to the legislature, and this decision is not final, for it has been appealed to the Supreme Court of the United States. On the other hand, the Indiana commission law has been declared to be constitutional; the power of the South Dakota⁵⁴ railroad commission over express companies, and of the North Carolina⁵⁵ corporation commission to require through connections has been recognized in court.

Rate orders of various commissions have been temporarily enjoined and are now in court for final decision—as in Kansas, Missouri, Virginia, Alabama and South Dakota, and a western railroad has prepared to test the validity of the Nebraska commission, but there is as yet no indication that the courts will reverse the decisions which they made at the time of the Granger commissions.

It is in the field of direct statutory regulation that there are numerous provisions unable to weather a constitutional test. On March 23, 1908, the United States Supreme Court, in a double case, declared unconstitutional the freight rate act of

Minnesota and the passenger fare act of North Carolina because the penalty was so severe as to prevent a carrier from testing their validity, and because the court regarded their enforcement as confiscatory. The two great principles that the enjoining of a state officer is not suing the state, and that a federal court may test the validity of a state rate act were established.

In Pennsylvania the State Supreme Court declared the two-cent fare act unconstitutional on grounds of confiscation, and in Alabama the Federal Circuit Court⁵⁶ on the same grounds enjoined the two and a quarter cent fare law and the freight rate act fixing maximum rates on 110 commodities. Preparation has been made to attack the two-cent fare laws of Missouri, Illinois and Nebraska and the freight rate act of Missouri, upon the ground that the penalties they impose come within the federal ruling made against the Minnesota and North Carolina rate acts.

Various statutes other than those fixing rates and fares have, likewise, been declared unconstitutional. The Alabama, Arkansas and Missouri statutes which prohibited foreign carriers from appealing cases to a federal court upon penalty of forfeiting their right to operate within the state were overthrown as infringing upon the rights of persons to sue in federal courts, guaranteed both by the state and federal constitution, and upon the grounds that the jurisdiction of federal courts is fixed by the federal constitution and may not be limited by legislatures.⁵⁷ The Supreme Court of Missouri has declared unconstitutional the law requiring free transportation for shippers of live stock, as discriminating against other shippers and in violation of the fourteenth amendment. The reciprocal demurrage law of Texas was overthrown and that of Minnesota is now being tested by the Great Northern Railroad. The laws limiting the hours of telegraphers and trainmen have been upheld by the Supreme Court of Montana and a state circuit court in Wisconsin, but have not as yet been finally ruled upon by a federal court.

SIBERIAN RAILROAD.

The Russian government submitted to the Duma the project for completing the Siberian Railroad according to the original plan, that is, down the north bank of the Amoor river to Chaborovsk, the northern terminus of the Ussuri Railroad from Vladivostok, which was the first section of the Siberian Railroad built. This is wholly in Russian territory, and separated from Chinese territory (Manchuria) only by the River Amoor. The line will be about 1,100 miles long, and it is proposed to construct it in four years. The cost is said to be estimated at \$110,000,000. The line has not yet been located entirely. This estimate is vastly greater per mile than the cost of the Siberian Railroad, though the entire route is in a river valley, and the river has been navigated by steamboats for many years. There was strong opposition in the Duma, but the bill passed on the first reading by 212 votes against 101. This will give Russia two lines to Vladivostok, for it continues to control and work the Chinese Eastern Railroad through Manchuria to Vladivostok, which is much shorter than the Amoor line, and through a much more fertile country. The negotiations for rails in this country recently reported were probably for this line. Most of the rails for the Siberian Railroad were supplied by Russian works, which the government protects so far as possible, but transportation by rail 4,000 miles or more from European Russia would probably cost at least \$20 per ton, and very much more than shipments by sea from America or England to Vladivostok. The building of a railroad in the Amoor valley is likely to give a market for Puget Sound lumber. The bridge

⁵³ I. C. C., Railways in the United States in 1902, Part IV. p. 28.

⁵⁴ Platt vs. Le Cocq, 150, 391.

⁵⁵ A. C. L. R. Co. vs. N. C. Corp. Com., 27 S. C. Rep. 285.

⁵⁶ Seaboard Air Line Railway Co. et al, vs. R. R. Com. of Alabama et al, 155 Fed. Rep. 792.

⁵⁷ Chic. R. I. & Pac. Ry. Co. vs. Ludwig, 156 Fed. 152; Seaboard Air Line Ry. Co. vs. R. R. Com. of Alabama, 155 Fed. 792.

timbers, etc., for the Chinese Eastern came from Puget Sound. The Amoor valley is wooded, but the timber seems unsuitable for most railroad uses. At least American lumber was taken directly up the Amoor and its southern tributary, the Sungari, for the Chinese Eastern. Ties and some other timber were obtained also in Corea, close to the Manchurian border, and it was in connection with Russian forest operations there that the differences with Japan began which resulted in the war. Russia will not be likely to get timber for the Amoor line from that source of supply. There is very little population in the Amoor valley, and a railroad in it is not likely to be profitable soon.

PNEUMATIC CAISSONS.

BY T. KENNARD THOMSON.*

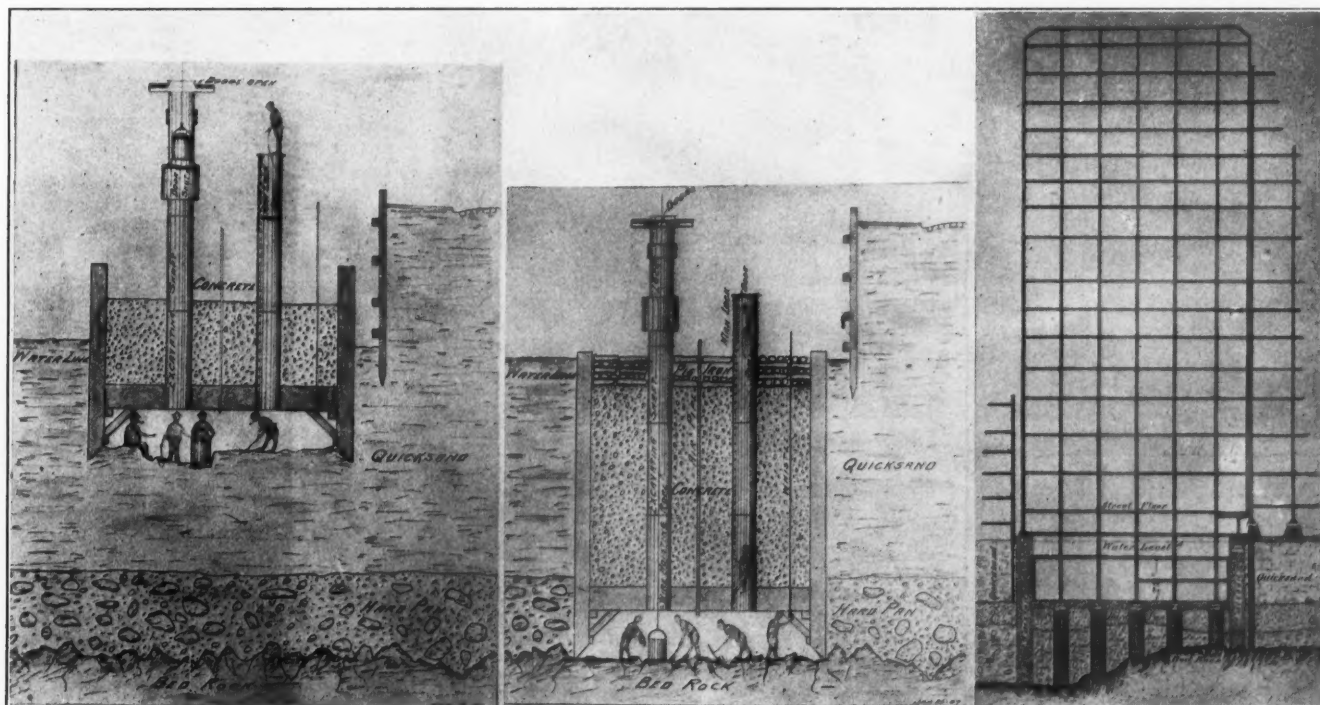
Caissons, under the name of Plenum Pneumatic Process, were first used in America in 1852 for a drawbridge over the Harlem river at Third avenue, where a number of cast-iron cylinders about 4 ft. in diameter were sunk to support each pier.

As the French had made some progress in this line, the

prevent the surrounding material from caving in, while pneumatic work requires in addition a roof or floor some 6 or 7 ft. above the cutting edge or bottom of the excavation. The roof can be a temporary one and removed after the cutting edge has reached bottom, or it can be left in place. While the roof has been put on top of the sides after they have been driven as far as they are to go, it very rarely is; one of the few cases being the Harlem river tunnel.

The usual method, however, is to build the caisson first with the roof or deck about 6 or 7 ft. from the cutting edge—the side having first been excavated to the water level—work in the open by cheap labor, of course, being cheaper than excavation in the air chamber by high-priced sand hogs, with the cost of the compressor, plant, etc., in addition.

By working very quickly and steadily, caissons have been sunk through New York quicksand some 16 to 18 ft. before air was applied, but the material becomes soggy very quickly, and it is more advisable to apply the compressed air from the start, generally beginning with 3 or 4 lbs., on account of operating the doors, etc.; although theoretically the pressure should start at zero, for as the only object of the compressed air is to keep the water from flowing in, the pressure of the air should just balance the pressure of the water. The weight



Caisson Fairly Started.

Caisson Down; Nearly Ready for Concrete in Air Chamber.

Mutual Life Building Foundations.

contractors of the Third avenue bridge brought a French engineer over at a high salary per diem, but after about a week, having learned all he could teach them, they let him go home, much to his disgust. This bridge was rebuilt by the city of New York some 43 years later, using a modern large caisson instead of a number of small ones, and the old cylinders on being removed were found to be in very good condition.

The word caisson is taken from the French caisson, from *casse*, meaning a box or chest, and is also used for an ammunition carriage. It is often used to describe either open coffer-dam work or pneumatic work, the first more by architects than engineers. Open cofferdam work, as the name would imply, is simply an excavation with supporting sides to

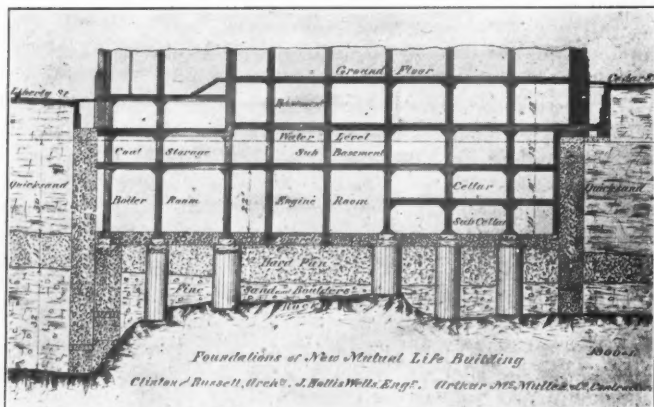
of fresh water is about $62\frac{1}{2}$ lbs. per cubic foot, or .434 lb. per square inch on the bottom, so if the water is 10 ft. deep the pressure will be 4.34 lbs. per square inch, and if the depth is 100 ft. the gage will show 43.4 lbs. per square inch, which is about the limit of pressure in which men have been able to work.

It would naturally be expected that caissons being sunk in a field or city might not have as great a water pressure at the same depths as a caisson being sunk in the middle of the river, but, as a rule, the actual pressure required in both cases will not be found to vary much from the pressure calculated from the hydrostatic head of water. It is as dangerous to have too high a pressure as it is to have too little pressure, for if it is too high a blow-out will occur, suddenly reducing the pressure in the working chamber and allowing the outside material to rush in before the pressure can be raised again.

In the Rapid Transit tunnel under the Harlem river, which

*Mr. Thomson designed the caissons for the railroad bridges across the Monongahela river at Pittsburgh, the Ohio river at Mingo Junction, the Susquehanna at Havre de Grace, the Missouri at Pierre, S. Dak., and others, and for the stone arch highway bridge over the Connecticut river at Hartford, Conn.

I have referred to, the sides were driven first and the roof was sunk from the surface on to the solid side walls of 12 in. x 12 in. sheeting so as to leave 25 ft. of water above the roof at low tide, this being the government requirement. Instead of driving the 12 in. x 12 in. sheeting one at a time, the contractor bolted three of them together, and by spiking two 3 x 4 in. timbers on in such a way that one 3 x 4 in.



Mutual Life Building Foundations.

piece on the adjoining three 12 x 12 would fit into it, forming a sort of tongue and grooved joint, which has proved very effective.

In this case the contractor did not wish to go to the expense of putting enough weight on the roof to withstand the entire air pressure which would be required to keep the water out of the air chamber; so he split the difference and used half the air pressure, theoretically required; that is, from 10 to 12 lbs. per square inch, and relied on the pumps to keep the water down. The pumps could not have handled the work without the assistance of the air pressure. This compromise plan proved successful, although the water broke in several times, giving the men a pretty good scare.

The success was undoubtedly due to the nature of the soil, clay, to a large extent, for this scheme would be too risky in a silty sand or gravel.

The first section to be sunk had a temporary roof under which the permanent roof was built after the material had been excavated, but the removal of this temporary roof, a solid wooden platform 3 ft. thick, was found to be so expensive and tedious that the next section to be sunk had the permanent roof of cast-iron lining inside of the concrete with half the sides (that is, the entire upper half of the tunnel) built on floats so that when it was sunk in place all that remained to do was to complete the lower half of the tunnel. This was not only much cheaper than the first plan, but also much safer, and was first suggested by the writer.

Fairly complete descriptions of the Harlem river tunnel will be found in the *Engineering News* and the *Engineering Record* of 1903.

For ordinary caissons, great variation has existed and still exists in the design and construction, some engineers using very thick timber side walls with a timber roof or deck 10 or 12 ft. thick, others reducing the thickness of the timber roof to 3 ft., while others again use plain concrete or reinforced concrete, and employ timber only for forms, while a few build the whole caisson and cofferdam of steel and cast iron. A good example of steel caissons was the Mutual Life building, where the sizes ran from 3 ft. diam. for underpinning cast iron caissons, to 8 x 22 ft. for the main caissons.

Several contractors in New York have recently tried sinking caissons of concrete only, using timber for forms and removing the forms as soon as possible. Theoretically, this method is the cheapest of all, but practically it has been found that it paid to leave an outside shell of timber on to permit the sinking to proceed continuously, which is not

possible when removable forms are used, necessitating a cessation of sinking for a day or so, sometimes several times for each caisson, to permit the concrete to harden before being subjected to the friction of the ground. The removal of the forms required considerable labor, sometimes high-priced, as in the case where iron angles were used and the forms were held together by means of steel bolts, which gave the iron unions a chance to insist upon the bolts being put in and taken out by iron erectors.

Concrete also causes slightly greater friction than planed boards, especially where the latter are greased. Most people seem to object to grease on the concrete itself.

In New York, as in many other places, the least friction is obtained by gradual but continual sinking, for allowing the caisson to take a quick drop of several feet and then perforce allowing it to stand for some time, gives the quicksand and other material a chance to adhere to the sides of the caisson, causing a very considerable increase in the amount of friction which must be overcome before the caisson can start again. Using forms instead of permanent sides, of course, prevents continual sinking.

Friction is a very hard item to estimate, as it depends not only on the nature of the material but also on the method of sinking, and on one job in New York city where very careful records were kept it was found that the friction varied from 150 to 650 lbs. per sq. ft. of exposed surface, the material passed through being what is called New York quicksand.

In order to reduce the friction on the sides, nearly all



Mutual Life Building Foundations.

Showing steel column in place before cellar was dug. Steel cofferdam around column being removed as digging of cellar proceeded.

beginners want to make the bottom of the caisson of larger cross-section than the top, thinking that as the hole excavated will thus be bigger than the caisson above the cutting edge, that they will thus obtain very little or no friction, but this has been repeatedly found to be a mistake, for in most cases it results in the surrounding material "caving in" and jamming against the sides, increasing the friction enormously.

At the Hawkesbury bridge, in Australia, where cylindrical open steel caissons or cofferdams were used which tapered from the bottom to the top, the material was excavated by dredging, and instead of the surrounding material flowing against the sides and causing a jam, as is the usual case, the reverse happened, and a water space or water-filled cavity was left around the sides, with the result that it was impossible to hold the caisson plumb. This gave so much trouble that material was dumped around the sides and then work was suspended for a year to allow the earth, etc., to pack around the caissons, after which sinking was resumed, successfully.

To give an example of the opposite result in this country, an engineer once divided his caisson into two piers above the deck, leaving an open space of some 20 ft. between the two piers, and in addition the sides were battered, with the result that the boulders, etc., caved in and jammed so firmly that some 1,200 extra tons of pig iron were required to overcome the friction—a very expensive experience for the con-

forming a sort of water jacket around the sides, which allows the caisson to sink, or rather, drop several feet at a time. This can often be repeated several times to advantage, but it disturbs the surrounding ground to such an extent that, in many cases, the material cakes against the sides, making each succeeding operation harder than the one before.

The only economical method of sinking is to have just sufficient weight so that the caisson will continue to move downward as fast as the cutting edge is undermined. Too much weight is obviously dangerous, as in soft material there is a risk of the cutting edge penetrating the material until the air chamber is filled with earth and water, and even if the men have all had time to escape it is expensive work digging in from the shaft to make room for the men and buckets.

The usual method, after a caisson has fairly started on its downward course is to dig about a foot below the cutting edge except just around the cutting edge itself, then removing the material directly under the cutting edge itself, and



Foundations for German American Insurance Building, New York.

tractors. As these contractors had to sink a second caisson of similar design, they profited by their experience and built a cofferdam on each side between the two piers and filled the space with earth, etc. They also built the sides vertical. While the railroad saved a few yards of concrete by dividing the caisson into two parts above the deck, and similar economies, it had to pay fully 50 per cent. more per cubic yard for the next bridge it built immediately following, which shows that the mere cutting down of dimensions does not always mean economy.

Another favorite expedient, and an equally costly one, is trying to overcome friction by jetting, thus saving the purchase and handling of pig iron, which always consumes a great deal of time and money.

It is, of course, very easy to shove a jet pipe, of $\frac{3}{4}$ in. diameter or so, down the side of the caisson, and to pump water through the pipe at high pressure, at the same time moving the pipe around the caisson, overcoming the friction by

by slightly reducing the air pressure for a very short interval the net weight of the caisson and its load is increased enough to overcome the friction and to allow the cutting edge to reach the bottom of the excavation. In many places, however, it is impossible to keep the water level below the cutting edge, in which case it is not usual to excavate below the cutting edge.

When passing through hard material, such as hardpan, boulders or rock, it is important to see that the excavation is made wide enough, or the caisson will surely become jammed. In fact, I have seen a 3-ft. diameter cylindrical cast-iron underpinning caisson become so jammed that four hydraulic jacks aggregating 320 tons would not budge it, and as the jacks were acting against the wall of a building it was not considered safe to jack any more for fear of injuring the building that we were underpinning.

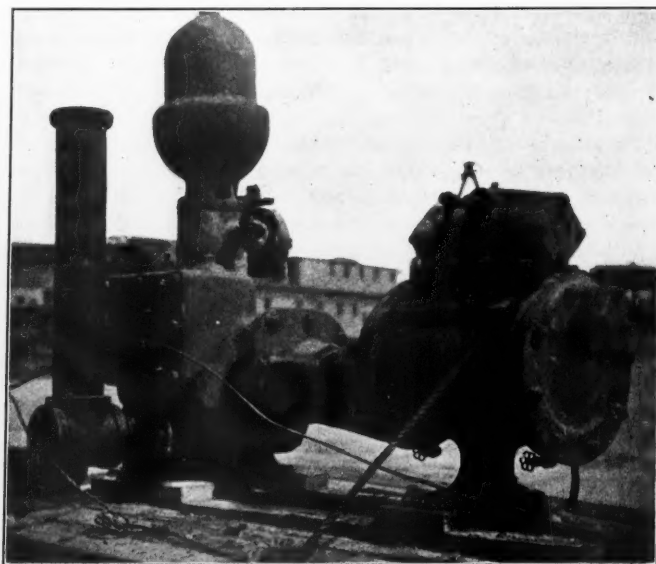
Much difference of opinion exists as to the proper form of the cutting edge, which, as might be inferred, is the bot-

tom of the caisson, the idea being that it cuts its way into the underlying material, though as we have seen, it is often necessary to excavate under the cutting edge itself. Many strive to obtain a knife edge (for the cutting edge) by means of steel plates and angles; while I have in many cases contented myself with an 8-in. channel laid flat. The knife edge is, of course, ideal, but is very expensive, and where it is really needed is almost sure to become bent and distorted, in which case it is far worse than no cutting edge at all.

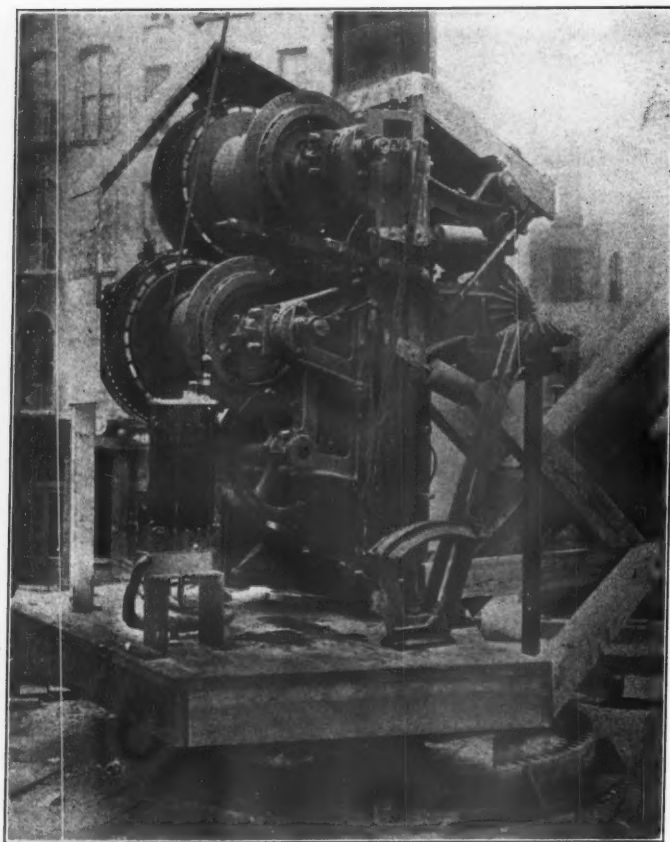
The cutting edge and sides should, of course, be designed with the object of giving the maximum room to work at or under the cutting edge, for, at the best, removing the material at the cutting edge is very much more expensive than removing the rest of the material.

While it is possible to analyze the strains in most structures, and it is possible to do so with a pneumatic caisson, still there is such a large element of personal judgment required that it is dangerous to lay down rules for others. Theoretically, if the air pressure just equals the outside pressure it might be argued that there are no strains on the sides or roof of the air chamber, but we know, as a matter of fact, that sometimes these strains are enormous and irresistible, especially when the caisson gets out of plumb or encounters harder material on one side than the other. Every experienced "sand hog" or caisson man has seen the roof badly deflected and the sides twisted out of shape. So it is essential for the designer to use his eyes and his judgment. He should also be familiar with the methods of the contractor who will use his plans—for a design that would be

For small caissons, say from 5 ft. to 12 ft. square, there should be a horizontal wall of 8-in. or 10-in. timbers from the cutting edge to the roof instead of the plank sheeting, properly braced at the corners, and inside of this there should be a 12 in. x 12 in. belt course under the roof. One solid course of 12 x 12-in. timbers is ample for the roof or



Cameron Pump.



Electrical Hoist for Mast; Hudson Terminal Buildings.

quite safe for one contractor would not be at all safe for another.

All wooden caissons should have an outside tongued and grooved sheeting of 2 in. or 3-in. plank laid vertically to avoid friction on long horizontal joints. Most contractors, however, use plank with a calking edge instead of tongued and grooved, and then calk with oakum.

deck, and if concrete is placed on the deck as fast as the caisson is sunk, the plank sheeting will be sufficient for the side walls above the deck, with light horizontal waling pieces, spaced about 5 ft. apart vertically.

For large boxes, up to 30 ft. wide, I have used, successfully, 27-in. sides, below the deck; that is, 3-in. plank against 12 x 12 horizontals, inside of which I placed a wall of 12 x 12 posts, about half of which extended from the cutting edge to the roof and the rest projected from 2 to 6 ft. above the deck, while the corner posts and an intermediate about every 15 ft. apart were extended to the top of the cofferdam, properly spliced at the joints.

Above the deck, horizontal 12 x 12-in. walings spaced from 3 to 5 ft. apart vertically were placed outside of the posts, the sheeting being spiked to the walings.

If the concrete were placed in the cofferdam on top of the caisson as fast as the caisson was sunk, all the bracing above the deck could be removed as the concrete reached the bottom of the brace, or omitted altogether in some places, but it is often necessary to keep the concrete 20 to 30 ft. lower than the surface of the water in order to prevent the caisson from becoming too heavy, when very heavy cofferdam bracing will be required to withstand the hydrostatic head. This is especially so when the water is deep, say over 30 ft., and bottom of the river consists of fine silt. Sixty ft. of water is the deepest in which I have started a caisson.

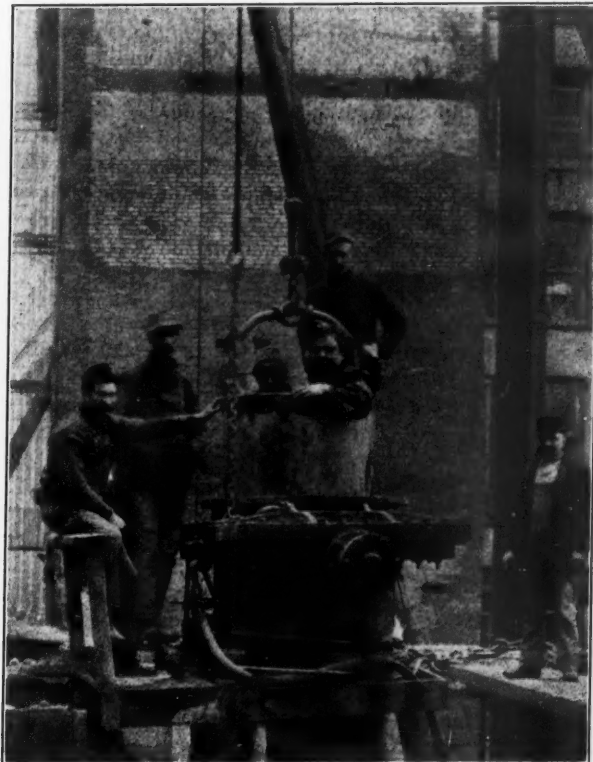
For deep water work it is necessary to so design the caisson and plant that there will be no danger of turning turtle, lack of which provision has resulted in several accidents.

Reference has been made to the advisability of having a shell of timber or steel even where the concrete is always above ground while being deposited, in order to save time and expense, and it is also necessary to prevent new or green concrete from being parted by the friction of the ground.

In sinking the first caisson for a New York city skyscraper, the Manhattan Life building, steel caissons were used, on top of which brick work was built, but it was found that the friction broke the new mortar, thus pulling the brick work away from the caisson. In any case, the cofferdam should be very securely attached to the caisson, the necessity of

which was proved in a river caisson where the clay was taken out of the air chamber and dumped over the side of the cofferdam to which it adhered, and broke the whole cofferdam, 106 ft. long, away from the caisson.

Many small New York caissons have been built with wooden sides and a 2-in. plank "form" under the roof, on which 2 ft.



Getting Ready to Enter the Lock.

of concrete has been laid and allowed to set for a couple of days, after which the form was removed and the concrete continued. At first, forms were also used instead of cofferdams for the sides above the roof, but after this scheme had been used for three or four buildings it was abandoned as not economical in practice.

In these caissons, sometimes the steel shafts were left in, and in other cases collapsible steel shafts or wooden forms for the shafts were used and then removed. Removing or leaving out the steel shaft in a small caisson is very risky and has been attended by accidents where the caisson has broken in two owing to greater pressure on one side of the cutting edge than the other.

Steel caissons have been used a great deal in the past, but are not used in New York much now, except perhaps for circular caissons, especially where of very small diameter. The advantage of using steel for round caissons up to 10 or 12 ft. in diameter, consists in the rapidity in which the light sections of cofferdam can be bolted on and filled with concrete, the time saved often being enough to pay for the extra cost of material. Another advantage is the ease with which they can be made water-tight.

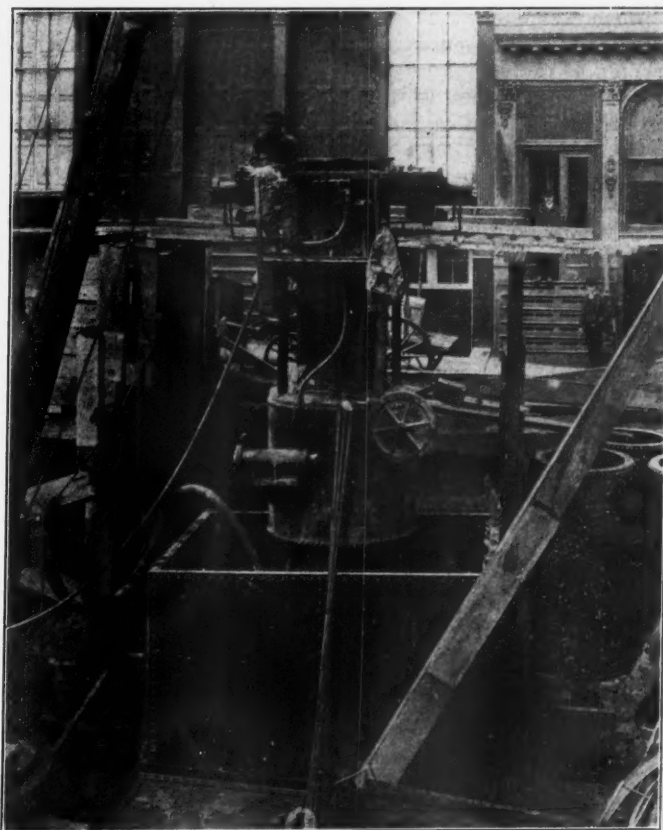
Small caissons for underpinning purposes are made from 30 to 36 in. diameter, of cast iron or built up steel plates. A good plan is to use steel cutting edge sections and make the upper sections of cast iron, using $1\frac{1}{2}$ to 2-in. metal. In underpinning the adjoining buildings to the extension of the Mutual Life building, in 1900, we used 26 of the small caissons from 60 to 80 ft. deep.

Twenty-seven in. inside diameter is the smallest pneumatic caisson we have worked men in, but they were cramped for room, and 33 in. inside diameter or 36 in. outside has been found to be a much better size.

For the main caissons of a new building, anything under 6 ft. in diameter is unsatisfactory, as there is not sufficient room for the men and bucket, and besides it is hard to keep small caissons plumb and in line.

In the above only those caissons in which the roof is left in place have been considered, but there are many places where it is desired to sink the caisson shell with a temporary roof and, of course, a temporary weight; where, for instance, the base of the column must be set below the surface of the ground before the main part of the cellar is excavated. This has been done in a number of cases in New York in recent years, where there are from three to four floors below the street level, both for the purpose of saving time by allowing the erection of the steel work to commence before the cellar is excavated, and also in order that the steel work and concrete floors may be used, as the cellar excavation proceeds, to obtain sufficient bracing for the side caissons, which are usually only 6 or 8 ft. wide, forming a wall around the buildings sometimes 60 or 70 ft. below the street line, and are entirely too light to withstand the enormous water and earth pressure without the horizontal bracing afforded by the floors.

It is necessary to use considerable common sense and experience in attempting to calculate the strains in a caisson. As regards the deck, for example, it is very easy to calculate the weight to be carried by the deck and the strains that would result therefrom, and we know that the air pressure acting up against the roof will counterbalance a great deal of this weight, making it, in fact, something like a pontoon floating in the water. But, on the other hand, the air pres-



Lock With Two Top Horizontal Sliding Doors.

sure is often slacked down to almost nothing in order to overcome the friction and is raised again before much water has time to enter the working chamber; and sometimes an accident to the air plant will suddenly cut off the supply of air, throwing a tremendous strain on the roof. If the principal weight on the roof is concrete it will in many cases be self-sustaining unless too fresh.

The same with the sides: if the material were absolutely homogeneous all around and the caisson were sunk absolutely plumb, which almost never happens, and the air pressure were kept just equal to the outside pressure, then we would have practically no strain on the sides—but all practical caisson men have seen the sides of caissons collapse, and some very strongly built ones at that. A very much more frequent cause of accident than loss of air pressure is to strike some obstruction on one side, deflecting the cutting edge, and thus throwing much of the weight of the caisson on the weakened side, making bad worse.

A caisson 8 ft. wide has had its sides so distorted and compressed that there was not room left for a 29-in. bucket to enter the working chamber from the shaft. In this case the working chamber was made much too light to start with and collapses occurred in the working chamber, and a couple broke in two above the deck and had to be stopped where they were in the quicksand, some 20 ft. above hard-pan, and the excavation continued under the cutting edge by lining the sides, as in the case of a vertical tunnel—a very risky proceeding, but successfully accomplished.

Some caissons have been sunk as much as 5 ft. out of plumb, an inexcusable state of affairs for a small caisson, for while we have said that very few caissons are absolutely plumb, still there is no excuse for their being more than a few inches out.

Large concrete steel caissons have been sunk, and in one case it was claimed that by using reinforced concrete the company had saved \$100,000 as compared with the cost of the steel caisson they had contemplated; but I have built an equally large caisson, 46 x 130 ft., of wood, the total cost of which was only about \$25,000. So if the cost of the reinforced concrete caisson were compared with a wooden caisson it would be rather difficult to show a saving of \$100,000.

In building wooden caissons I very seldom halve the timbers or use dovetailed joints, preferring to use butt joints as much as possible with plenty of drift bolts. The trouble with butt joints, however, is that while a carpenter will make a dovetail or halve-joint fit he will probably leave an inch or so play in a butt joint.

The deck timbers as well as those in the sides should be planed on one side and one edge, for the sizes would otherwise vary too much to get a good job, while the planking for the outside and inside of the air chamber should be either tongue and groove, or the sides should be planed for a calking joint. The plank should, of course, have its faces also planed.

It is very important, and difficult, to keep the water out of the cofferdam, and it requires great care with the calking, for sometimes a joint under the cutting edge is not completely calked, with the result that the water finds its way up through the sides and into the roof or deck and thence through the concrete, forming a very bad leak which it is impossible to stop, as its location cannot be discovered. This often necessitates continual pumping in the cofferdam while new concrete is being deposited, which is, to say the least, of no benefit to the concrete.

One of the most important contrivances on a pneumatic caisson job is the air lock, without which the work cannot be carried on.

A lock is essentially an air chamber having two doors, one opening to the atmosphere and one into the working chamber or shaft. In the early caissons the lock was placed below the shaft in the working chamber, and when the material was placed in the bucket in the lock, the lower door was shut and the air allowed to escape from the lock, when the upper door was opened, allowing the material to be hoisted out. This was an inconvenient and unsafe position for the lock; in fact, it seems to be about the worst position that could have been selected, for if the caisson became too heavy there would be danger of smashing the lock, and then the lock had to be taken to pieces and taken out before the shaft could

be filled. The reason for putting the lock in such an awkward position was probably to permit adding to the shaft and cofferdam without removing the lock, before the idea of having an additional door at the bottom of the shaft in the air chamber occurred to caisson men. This door at the bottom of the shaft is now used when it is desired to lift the lock off temporarily to place more shafting, so as not to permit the air to escape from the working chamber during the operation. The door is also useful in case of emergency or accident.

It probably did not take long for the advantages of placing the lock on top of the shaft to become apparent. But at first the hoisting mechanism was placed inside of the lock—so the bucket would be lifted from the working chamber up into the lock, after which the bottom door would be closed and the material dumped through a side door or lifted up through a top door. Cumbersome and slow as such a method is, requiring the material to be handled twice instead of once, it is still used in Europe, but very seldom in this country.

It was long, however, before this lock was superseded by the modern locks which permit the bucket to be lowered into the air chamber, filled, taken out, emptied and returned to the working chamber without detaching it (if desired) from the cable of the hoisting engine. The first lock to accomplish this time and money saving result had the top door in two horizontal halves, meeting over the center of the shaft, having a hole for a stuffing box about 3 or 4 in. diameter at the center of the joint between the two halves. This stuffing box was so arranged with packing, etc., that the steel cable could pass through it freely without allowing much air to escape. The stuffing box, of course, remained on the cable near the bale of the bucket when the bucket was taken out of the lock.

It has now been almost entirely discarded, as it has been found by experiment that it is only necessary to allow a hole in the door or doors sufficiently large for the cable to pass through, and that the resulting loss of air is not sufficient to make a stuffing box (patented) necessary. As there is no object in the cable passing through the bottom door of the lock when the bottom door is shut, the best form for the lower door is a single round door slightly larger than the opening, hinged on one side and known as a flap door, as it swings up against its door seat and is held there by air pressure. A rubber gasket is usually attached to the door to prevent the air escaping between the door and its seat. The gasket is usually $\frac{1}{2}$ in. thick and from 3 to 4 in. wide, in the shape of a ring, about the diameter of the opening.

Thus, in present practice, the derrick lowers the bucket into the lock when the upper doors close against the cable, and after the lock has been filled with air the bottom door is allowed to drop open of its own weight, when there is nothing in the way to prevent the bucket being lowered to the working chamber, filled with material and hoisted into the lock again. Then the lower door is swung up by levers from the outside, the air in the lock allowed to escape, permitting the top doors to be opened, etc.; and the entire cycle of filling, emptying and returning a half yard bucket is performed 20 times an hour; a vast improvement on the old system. Numerous patents have been taken out to get around the original patent. One has a circular flap door for the top as well as bottom, the top door having a slot from the side to the center, permitting the door to shut while the bucket is suspended in the lock, an additional contrivance being required to then close or cover the slot.

Another lock, much more used, has a circular top door so placed that the edge of the door is directly over the center of the shaft, permitting the hole for the cable to be put in the side of the door instead of the center. This requires the lock tender to give the bucket or cable a slight push as the bucket enters and leaves the lock, which he easily accomplishes.

It would seem that every conceivable useful form of lock has been patented, and though there are numerous lawsuits pending, none have been settled.

All the locks described so far have doors which open in, so that when they are shut the air pressure tends to hold them shut, which is the only safe way, for the greater the air pressure the tighter the door will be shut. But to get around the original patents, locks have been built with upper doors which are held on from the outside by means of screws, etc., and when the bucket is taken out of the lock the door remains on the cable with the stuffing box, over the bale of the door. This patent was at once bought up, and as its only use would be to get around other patents, very few of the locks were ever manufactured.

In city work the material excavated from the caissons is nearly always removed by buckets through the air locks, but in big river caissons it is usually much cheaper to use "blow pipes." A "blow pipe" is simply an iron pipe, usually 5 in. diameter, from the deck of the air chamber to the surface. At the top is an elbow to deflect the material, and in the air chamber is a flexible pipe connected to the iron pipe; at the lower end of the flexible pipe is a valve. The sand or other material is shoveled up against the valve and when the valve is opened everything in front of it, even good-sized pebbles, is blown out, sometimes 100 ft. or more beyond the end of the pipe. The material can be blown out so much quicker than it can be shoveled against the bottom of the pipe that the valve is necessarily kept closed much of the time.

The blow pipe is operated by simply allowing the compressed air in the working chamber to escape, carrying the material with it, the air pressure, of course, not being increased beyond the pressure required to keep the water out of the working chamber. But as a rule "blowing" is not resorted to until the pressure is about 8 or 10 lbs. per sq. in. The men have to be careful not to let their hands get caught, as they would have a good chance of losing them; in fact, the force is so terrific that the very hardest material is required for the upper elbows and I have seen cast-iron elbows with metal two inches thick worn clean through in a couple of hours and less. Sometimes big blocks of oak are cut to fit over the elbow and roped on until a new elbow can be obtained.

The contractor for the first caisson for a New York skyscraper attempted to blow out the quicksand—blowing it out very wet and allowing the water with a good deal of sand to escape into the sewers. This was a very economical arrangement at first, until the sewers got "plugged" and the city put a stop to the operation.

Bucket locks are much used for concreting the working chamber as well as for excavating small caissons; but for the large caissons or where there are two shafts, a special concrete lock is used. This is usually an ordinary 3-ft. shaft with a door in the bottom and a cone above the lower door. The lock is placed on top of the shaft and has a hopper arranged over it. As soon as a yard or so of concrete has been dumped into the lock, the top door is shut and the bottom door is opened, allowing the mass to fall down the shaft into the working chamber. The concrete can thus be taken in about as fast as the men below signal that they are ready for it.

Concrete should be made very wet, wherever possible, but the men in the air chamber do not like it wet at all, and they are always asking for dryer concrete. As long as the concrete is spread in approximately horizontal layers it cannot be too wet, but when it is necessary to bench it around the sides and under the roof it is impossible to use wet concrete. It is customary to fill the air chamber in horizontal layers to within about 3 ft. of the roof and then bench the concrete around the sides and under the deck until there is only a space under the shaft left. The men, of course, prefer, where they can, to keep a working space about 5 ft. high. The concrete is usually carried to within 3 or 4 in. of the roof, and the remaining space is then filled with mortar packed in place with a wooden rammer about 3 x 1 in. by 3 ft. long,

driven or pounded with an 8-lb. hammer—which gives a very good job, but is, of course, very slow.

Sometimes the concrete is carried up horizontally to within 18 in. of the deck and allowed to set hard, at least 12 hours being necessary, when the air is taken off and wet concrete is dumped down the shaft. The trouble with this method is to be sure that all the spaces under the roof get filled, for no one who has not tried it would believe that the water in the concrete could disappear so completely. I have seen a caisson with two 3-ft. shafts about 6 ft. center to center, where the concrete was dumped down one shaft in an absolutely "sloppy" condition, and yet when we suspended work to examine the concrete, we found that the concrete was filling the shaft it was dumped in without filling the space under the deck to the adjoining shaft. I have seen concrete dumped into a shaft so wet that one would expect to see a couple of feet of water on top of the concrete, and yet when the work was stopped the concrete looked almost dry.

If mortar is to be made watertight the proportion should never be poorer than one volume of cement to two volumes sand, to insure filling all the voids in the sand. For the same reason the proportion of cement and sand should be the same for concrete where as much stone can be used as can be covered, depending on the smallness of the stone or gravel and the wetness of the mass; much more stone can be used if the stones are small and the mass wet. I have made caissons watertight against a head of 80 ft. of water by concreting to about 6 in. above the cutting edge and then placing a layer of mortar about 2 in. thick and covering this at once with good wet concrete, 1—2—4. And yet many say that it is impossible to make concrete hold water—which, however, is certainly true as far as "dry" concrete is concerned, that is, concrete that requires ramming to bring the moisture to the surface.

The concrete in the cofferdam above the deck should also be put in very wet, and though it is very customary to use a 1—3—5 concrete for this purpose, I would much prefer a 1—2—4 mixture, though the amount of stone could be increased as stated above if judgment is used.

Great care should always be exercised when pumping is necessary to avoid pumping the cement out of the concrete and thus ruining the mass. I have heard a contractor brag of using eight big pumps, with 6 in., 8 in. and 10 in. discharge pipes, on an open cofferdam 30 x 50 ft., while concreting. Small wonder he had not much confidence in concrete after such abuse.

The amount of concrete placed on the deck of the caisson while sinking often depends on the amount of weight required for the penetration. On shore, for instance, the friction on the sides starts at the surface and the concrete on the deck has to be kept above the surface of the ground until all the concrete is in that will be required for the finished structure, when pig iron or other temporary weight has to be added. But in river work, where the water is often from 20 to 60 ft. deep to start with, the caisson would be too heavy if the concrete were kept up to the surface of the water; in fact, sometimes the level of the concrete in the cofferdam of the caisson is as much as 30 ft. lower than the surface of the water, which requires very heavy cofferdam bracing and makes any leak in the cofferdam or deck of the caisson very troublesome and dangerous on account of the great head.

(To be continued.)

Belgium has had a railroad accident, at Contich, altogether out of proportion to the size of the country, 40 having been killed and 324 injured, all resulting, according to the reports, from the failure of a man to give a signal. The claims for damages are so great that there is talk of limiting the amount payable below the \$20,000 to \$60,000, which are claimed in some cases.

EGMORE STATION, MADRAS; SOUTH INDIAN RAILWAY.

For some time it had been felt that the traffic to be handled in Madras had outgrown the accommodation provided for it at the Egmore station, and that something better was required than the old-fashioned, cramped station which had done duty for many years as a terminus for the South Indian

Railway. Henry Irwin, C.I.E., was therefore invited to design a building suitable to the needs of the traffic, and worthy of the city of Madras. After many alterations in his plans, the present building, which was opened June 11, was decided upon.

The building is after the Moghul style of architecture, built of brick relieved with handsome granite and Thada



General Elevation of New Egmore Station at Madras.



Third Class Waiting Hall; Egmore Station, Madras.



Train Shed; Egmore Station, Madras.

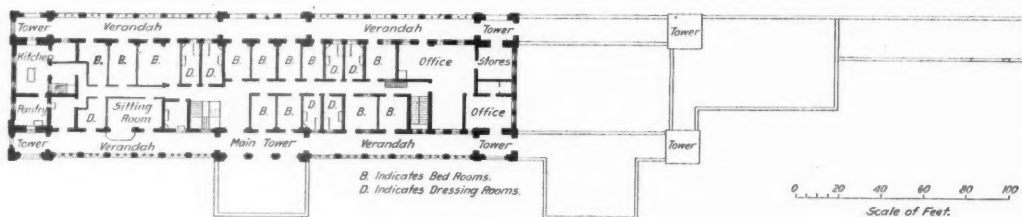


First Class Waiting Hall; Egmore Station, Madras.

sandstone work. There is a granite plinth on the road frontage up to basement level, and the intricate stone carving, fantastic-shaped brackets, drip stones, and rich friezes at once attract the attention of any observer to the excellence of the structure from an architectural point of view. The fine carved granite stone work of the porches, one opposite the first and second-class and the other opposite the third-class passenger entrance, is worth particular notice. From a distance, the symmetrically placed towers, and small characteristically shaped semi-circular domes present a fine appearance against the sky-line and lead one to expect, what is

with lavatories, and a sitting room. Each bedroom and the sitting room is provided with an electric fan, an electric bell and a telephone, by means of which the occupants can make known their wants to the attendant of the refreshment room without having to call or wait for a servant to come to receive the order. Water is laid on to the lavatories and bathrooms, and the sanitary fittings throughout the building are of the latest water system pattern, drained in the most approved manner.

Outside of the building there are three departure and arrival platforms 895 ft., 700 ft. and 650 ft. long, respectively,



Plan of First Floor.

realized on a close approach, that the station ranks as one of the most beautiful of the public buildings in the city of Madras.

The main building (330 ft. long by 71 ft. wide) is two stories high. The lower floor, at platform level, is occupied by refreshment rooms, waiting rooms and the usual offices for the station staff; also the postoffice. At the east end of the building there is a single-story extension (67 ft. x 45 ft.), in which a large and well-appointed luggage and parcels office is provided, and beyond this another single-story building (90 ft. x 20 ft.) for the government railway police and for lamp and storerooms.

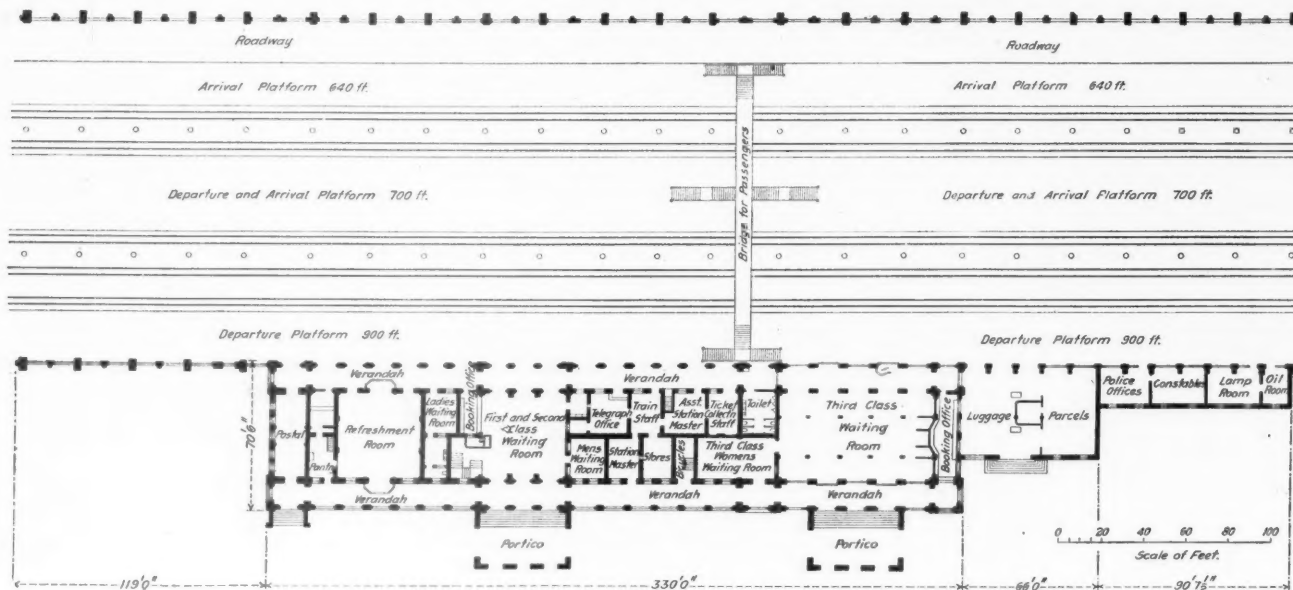
The accommodation for the comfort and convenience of passengers leaves nothing to be desired. There are two spacious waiting or booking halls, one for first and second-class passengers (40 ft. x 37 ft.), and separated from it by the space occupied by the station offices, another for third-class passengers (76 ft. x 52 ft.) with a large waiting room for native ladies leading off it. There are well-furnished ladies' and gentlemen's waiting rooms for first and second-class passengers, and a large dining and refreshment room (40 ft. x 40 ft.), with a buffet on to the platform, where light refreshments can be had, completes the accommodation downstairs. On the upper floor there is an office at the east end for the district traffic superintendent, and at the west end a kitchen, the space between being occupied by 13 bedrooms, 6 bathrooms

connected by a fine iron footbridge, and covered over for a length of 602 ft. by a three-span steel plate roof with glazed gable ends.

The station and platforms are lighted throughout with electric light, and the rooms are fully equipped with electric fans, the power for which is produced in the railway company's power house adjoining the premises. An up-to-date suction gas plant is to be put down, but has not yet arrived, so the dynamos are to be temporarily driven by steam.

The building was begun in September, 1905, and the work has been executed and the details worked out by the company's architect, E. C. H. Bird, to whom much credit is due for the satisfactory way in which the construction has been carried out. T. Swaminatha Pillai, of Bangalore, carried out the contract for the building, except the special work of the reinforced concrete floors, roofs and partitions, which was done by Messrs. Arbuthnot's industrials.

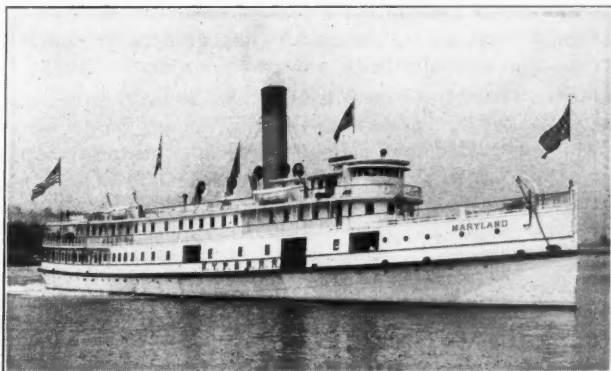
To provide space for the new station, and greater facilities for handling trains, which the increasing business of the company demands, the lines and platforms of the old station have been entirely rearranged; and in order to complete the work of the extension of the sidings, the old station building will be demolished as soon as the new station has been opened. The station house and platforms occupy an area of $3\frac{1}{4}$ acres, and the covered platform area is greater than that of Charing Cross station in London.



Plan of Covered Way and Ground Floor; Egmore Station, Madras.

THE NEW YORK, PHILADELPHIA & NORFOLK.

Within a few days the Pennsylvania Railroad Company will formally assume the ownership of the New York, Philadelphia and Norfolk Railroad. The Pennsylvania's offer to purchase the stock of this line by giving \$3 in bonds for each \$1 in stock expired August 1, and has been accepted with practical



Passenger Transfer Steamer Maryland.

unanimity by the shareholders. Thus will end the independent existence of one of the most important short lines of railroad in this country.

This road extends from Delmar on the state line of Delaware and Maryland down the backbone of the Peninsula between the Atlantic Ocean and Chesapeake bay to the town of Cape Charles, Va. From there freight cars are carried by barge to Norfolk, where connections are made with the Norfolk & Southern, Norfolk & Western, Atlantic Coast Line,

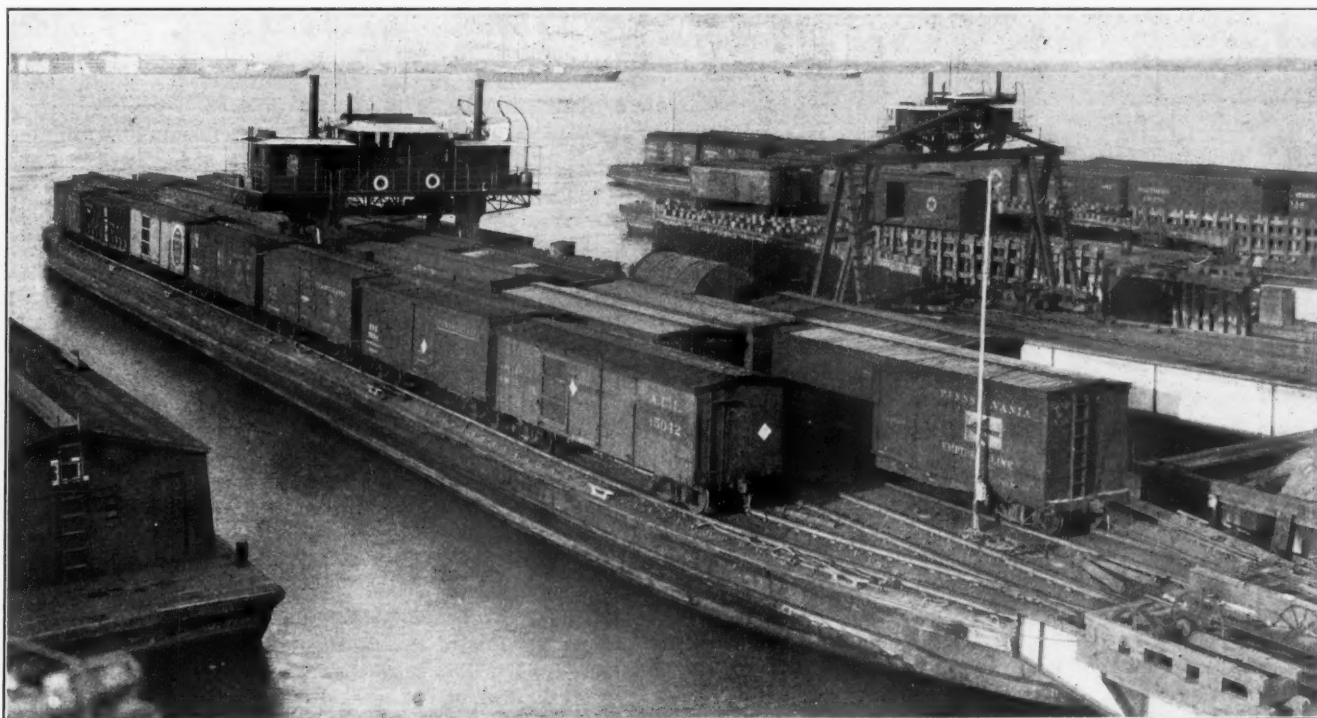
the stock might have been purchased at 30 cents on the dollar.

For several years past this company has paid a dividend of 12 per cent., and in 1906 declared a stock bonus of 25 per cent. The fact that it has become so profitable is due to the foresight and skill of A. J. Cassatt. It was to the Nypano that Mr. Cassatt actively devoted his great powers of railroad management during the period between 1884 and 1898, when his connection with the Pennsylvania Railroad was only that of a director. He gave his time and energy without compensation, and while the public thought he was devoting his talents to raising horses, supervising country turnpikes, or cruising in his private yacht, as a matter of fact his heart was in the upbuilding of this little road, which, when it was projected, the Pennsylvania Railroad itself had refused to build. Later on, a contract was made which gave the Pennsylvania an option upon the stock at favorable terms, thus preventing anyone else from getting hold of the property.

Mr. Cassatt developed the road, put his own money into it, and made it pay. When he became president of the Pennsylvania, he resigned the presidency of the small company, but lest there might be criticism he refused during his lifetime to allow the Pennsylvania to purchase what had become a natural tributary to the Pennsylvania system.

The principal ownership of the New York, Philadelphia & Norfolk has accordingly, since Mr. Cassatt's death, been vested in the Cassatt estate. Aside from J. G. Cassatt and R. K. Cassatt, who have represented the interests of the majority stockholders, the other directors of the company have been Messrs. W. A. Patton, President; C. A. Griscom, Rudolph Ellis, John Lloyd and Henry W. Biddle.

The purchase of this line will mark the entry of the Pennsylvania into the city of Norfolk, Va., and will give the Pennsylvania Railroad an alternative low grade route between the North and the South. In fact, the line via Norfolk will con-



Steel Barge at Port Norfolk, New York, Philadelphia & Norfolk.

Chesapeake & Ohio, Southern, Seaboard Air Line and Virginian Railway.

Including the 36 miles of ferry, the New York, Philadelphia & Norfolk Railroad is only 147 miles long, yet, with an unchanged mileage, its gross earnings grew from \$313,148 in 1885—the first year of its operation—to \$3,181,149 in 1907. There were many lean years, however, and even ten years ago

stitute the shortest and most economical route from an operating standpoint, between New York and points along the Southern seaboard. Taking Wilmington as a common point, the distance to Norfolk by the Cape Charles route, including the ferry, is 228 miles; to Richmond, the most important Southern gateway via Washington, it is 224 miles. The Nypano is laid with 85-lb. rails, and on the main line between Delmar

and Cape Charles there is one tangent 42 miles long. About 92 per cent. of the total line is absolutely straight. Though this road is at present of a single track, it has over 70 miles of sidings, and it will be necessary to double track the main line within a few years.

Richmond and Alexandria draw traffic for perishable commodities from well defined territories. Deliveries in northern markets can be made a few hours earlier by this route than via Norfolk, on account of the delay incident to ferry transportation. Nevertheless, there is a vast territory permanently tributary to the Norfolk route, and there is every reason why an increasing amount of slow freight should move by this gateway. There are heavy grades between Weldon and Richmond, on the Seaboard Air Line, and between Rocky Mount and Richmond on the Southern Railway. Twice as much tonnage can be carried with one engine from these points into Norfolk as into Richmond. And so economical has the N. Y. P. & N. made transportation by ferry that it is possible to carry commodities in this way across the mouth of Chesapeake bay at about the same rate per ton mile as by a low grade rail route.

That a line of such importance should have been built under independent management is little less than remarkable. William L. Scott, of Erie, Pa., as the original proponent of the scheme to build this road, unable to make much progress with it, broached the plan to Mr. Cassatt, who immediately became enthusiastic. His enthusiasm was intensified by a journey made in person through the 65 miles of virgin forest land which it was proposed the new line of railroad should penetrate. Mr. Cassatt recommended to the Pennsylvania Railroad that they build the line. President Roberts, however, did not share Mr. Cassatt's enthusiasm, and the proposition was declined.

It is small wonder the proposition to build this line excited but little favor among the Pennsylvania officers. The struggle to bring Norfolk and Philadelphia closer together in a transportation sense had been a prolonged and a losing venture. Even as far back as 1825, passengers were carried down the Delaware river by boat to Dona, and then by tally-ho post coaches to Seaford, on the Nanticoke river—46 miles overland—where steamer was again taken to Norfolk. The Delaware Railroad, now the principal artery of travel on the Peninsula, was designed to carry out the old project of connecting Dover and Seaford by rail.

Many factors brought the scheme to an unpropitious end. Later the Delaware Railroad was connected with the Pennsylvania at Wilmington, and there was a through rail connection established to Seaford where steamers took passengers and freight to Norfolk. This, again, was a failure. Then the Eastern Shore Railroad was built from Delmar to Crisfield, an ancient oyster village, where a line of steamers, known as the Anna Messic Line, sought to meet the demand for a through connection to Norfolk. It, too, suffered an inglorious death.

It now came to be the opinion of many that the only purpose of railroads in the Peninsula should be to serve the local needs. For this purpose a branch line of nine miles was built from the Eastern Shore Railroad at King's Creek to Pocomoke City. This branch was the original Nypano, and it was destined to become the mother corporation, eventually to turn the Eastern Shore road to Crisfield into a mere feeder for the main line.

Such in 1883 was the uninviting nucleus of the proposed railroad to Norfolk. It seemed that the possibilities of the region were thoroughly developed. It was the purpose to extend the line 65 miles further south to Cape Charles. The narrow Peninsula was covered with a dense forest, underneath which was a sandy soil which did not promise much freight tonnage. At Cape Charles trains were not to be unloaded, but the cars were to be pushed on barges and ferried across the Chesapeake to Norfolk—something then unheard of in either

railroad or water transportation. But the harbor at Cape Charles was very shallow and the proposed plan of carrying loaded freight cars on a barge across 36 miles of water, often very stormy, was regarded as visionary in the extreme.

But Mr. Cassatt foresaw the time when the Peninsula forest should be cut down and the land become a wonderful producer of fruits and vegetables. He determined to spend his own money building a harbor at Cape Charles, in case he could not induce the United States Government to do it. A channel 1,000 by 600 ft. was accordingly dredged by the company, so as to afford 12 ft. of water at low tide.

Then Mr. Cassatt declared that the way to carry cars across Chesapeake Bay in barges was to carry them. So successful has this plan proved that the same principle has been adopted at numerous other places, notably on the Great Lakes. At the start the barges were designed to handle only 18 cars, whereas at the present time the company owns 11 large steel car floats, some of which have a capacity of 30 cars, which amounts to a full train of fast freight for each barge. An idea of how this barge traffic has developed in recent years may be observed in the fact that while in 1900 the company moved 578,000 tons of freight by barge, and handled 37,000 loaded and 10,000 empty cars over its ferries, in 1907 the number of tons of freight moved in this way amounted to 105,000 loaded and 33,000 empty.

Though Mr. Cassatt might overcome the physical difficulties which presented themselves, there was yet another difficulty, which to the practical railroad man, seemed even more serious. All the railroads which then entered Norfolk were accustomed to tranship to northern points by steamship. The railroads themselves owned a large interest in these boat lines, so that the traffic agreements between the rail and water lines seemed almost impossible to break through, especially as the boat service was very well developed, and the rates low.

Here, however, Mr. Cassatt saw far into the future. He realized the strategic importance of Norfolk as a railroad center. He saw that a large portion of this traffic which came into Norfolk by rail could move to the North much more easily, if it could be carried through without transshipment. The facts now show that a vast farming section immediately to the south of Norfolk could never have reached its present state of prosperity under the old conditions. It would be a physical impossibility to transfer from car to boat more than a limited quantity of commodities. Yet if these same articles could be shipped in carload lots direct they would reach not only the seaport towns, but they would gain the time involved in transshipment at Norfolk, and be able to reach interior points throughout the country.

Thus it has come to pass that during the spring and summer the Norfolk & Southern Railroad, for example, delivers to the N. Y. P. & N. line about 200 carloads of perishable products each day. Perishable products contribute about 14 per cent. of the revenue of the N. Y. P. & N. In 1900 the company shipped only 141,266 barrels of potatoes, while in 1907, the figure amounted to 2,064,778 barrels. In 1900 the company handled 14,311 cars of perishable products, while in 1907 the number was 20,691. A large proportion of the land from Delmar to Cape Charles, and an almost indefinite acreage along the line of the railroads south of Norfolk are still available for trucking purposes. This perishable freight, consisting as it does of the necessities of life, is less dependent on the fluctuations in trade than most other commodities, and the market in the large centers of population in the East is constantly expanding. The growth of this traffic is probably only limited, therefore, by the market for the consumption of these commodities. A few years ago the vegetable and fruit movement lasted but two months in the year. It now continues for some eight or nine months. More diversified products are being grown, and the railroads have developed a very rapid freight service. This has opened new markets and widely extended the area of consumption. The very low

rates which have prevailed on the railroad have been controlled by water competition, thus giving to the farmers a considerable margin of profit on their output.

Mr. Cassatt also foresaw the future course of the great lumber business which centers at Norfolk. In that region south of Norfolk and directly west of Albemarle and Pamlico sounds there are vast tracts of timber lands. Although a great deal of this timber has always been shipped by boat, yet it was observed that a tremendous quantity of lumber could be sent in carload lots by rail direct to interior points much cheaper than by boat. Some 45 per cent. of the revenue of the N. Y. P. & N. has accordingly been derived from lumber, and the lumber tributary to its territory shows no likelihood of being exhausted. As the timber is cut back the boat competition through the bays and canals is eliminated, the higher land is reached by logging roads, and these factors operate to increase the rail shipments. The extent of this lumber industry may be in some degree measured by the fact that there are in Norfolk 35 lumber concerns, many of which do an enormous business.

In spite, therefore, of the great difficulties of obtaining traffic from the hard and fast combination which existed, the New York, Philadelphia & Norfolk Railroad has gradually been making its way. The conditions up to 1899 were exceedingly onerous. About the time friendly relations had been established with the lines into Norfolk the hard times of 1893 came on, and the road was in difficulties. In 1898, Mr. Cassatt determined upon a reorganization, and an assessment was made upon every shareholder and income bondholder and the interest on the first mortgage bonds was scaled from 6 to 4 per cent. He determined, too, to enter upon a line of heroic improvements to be able all the better to handle the traffic, which he felt sure had only been delayed in arriving.

Up to that time the barges were forced to make their deliveries to connecting lines at the pontoon piers of each railroad. The N. Y. P. & N. had a yard of its own for Norfolk local deliveries, but these rails were of no value so far as connecting railroads were concerned. The company, therefore, built an extensive terminus at Port Norfolk, a small cape jutting out into the harbor just west of Portsmouth.

Mr. Cassatt next set about the construction for the N. Y. P. & N. of a "Belt Line" which should connect Port Norfolk with all of the lines entering Norfolk. After the surveys had been made, and the options upon the right of way obtained, representatives of all the other lines entering Norfolk were invited into conference. Mr. Cassatt proposed that this "Belt Line" should be built by all of the railroads jointly, and should serve as a switching road between them all.

The roads entering Norfolk had up to that time been very much at loggerheads, but this plan that they should pull together on behalf of the new line struck a popular chord. The diplomatic solution of that question has resulted in harmonious relations having been maintained by all those roads ever since. The Belt Line is now owned jointly by the N. Y. P. & N., Atlantic Coast Line, Chesapeake & Ohio, Southern, Seaboard Air Line, Norfolk & Southern, and the Norfolk & Western Railroads. The Virginian Railway, which is being built into Norfolk by H. H. Rogers, has also been accorded equal facilities (and when it is opened for traffic will doubtless be admitted into equal joint ownership). The Belt Line gives access interchangeably for traffic to all lines at Norfolk, and in addition there are some 50 industrial establishments located on its rails. The railroad is some 7½ miles long and about a third of it is double-track.

It was at first expected that through passenger trains of sleeping cars could be taken over the N. Y. P. & N. route to the south, and traffic arrangements had practically been completed with this end in view. Furthermore, a vessel similar to the one now used in New York Harbor to convey through trains between Boston and Washington from the New Haven to the Pennsylvania tracks, was built for this service. Com-

plications arose, however, with the roads in Norfolk which made impracticable the consummation of this plan, and the steamer which had been purchased at great cost became of little use. Since that time passenger traffic has been conveyed by commodious passenger steamboats, which also do a considerable local traffic between Cape Charles, Old Point Comfort, Norfolk and Portsmouth.

In numerous ways this railroad has reached a remarkable state of development, and has made an extraordinary contribution to the prosperity and comfort of the territory it reaches. It has developed the fastest freight line in the country. A regular scheduled train leaves New York at 7 o'clock in the evening, and makes deliveries in Norfolk early next morning. The train runs at an average speed of 32 miles an hour. This service has thus made it possible for shippers in New York to load cars up to late in the afternoon and not be subjected to the necessity of delivering their goods at steamboat piers in order to be loaded before 3 o'clock, the sailing time of Norfolk vessels.

Forty per cent. of the total revenue of the N. Y. P. & N. road is derived from traffic originating in the territory immediately tributary to it. So important has this development become that several years ago the company chartered a new line to extend from the town of Cape Charles for 11½ miles south to Cape Charles Point, the purpose being to properly accommodate the local traffic to be obtained from that district.

Causes and Sources of Claims.

The stream of loss and damage claims may be likened to a great river. The sources of the stream, the little springs, are the General Managers, the Traffic Managers, the classifications, the rates, the Contracting Agents, the people who ship, who haul the goods, who receive the goods, who load and handle cars, who forward the cars, who receive the cars and the goods.

One spring is the loading clerk. Is a car dirty? He doesn't see it. Does the roof leak? He loads in a freight house, and it isn't wet there. Had the car been emptied of lime, or cement, or oil, or bulk salt pork? In goes the flour, or the baled goods, anything that can be damaged by grease, soiled by dirt, spoiled by nails, ruined by water. He puts in goods that should go into other cars. He leaves out goods that should go in. Piles pig lead on coffins; stands slender tables on their legs, astride of other goods, and piles heavy stuff on top, and the legs break; piles up uncrated household goods in any old way; the rockers punch holes in mirrors and pictures (which are always high-priced family portraits, and heirlooms and invaluable), stands show cases on end; puts pasteboard boxes of millinery next the household goods and braces 'em with a cook stove. At the end of the haul the cook-stove is not to be separated from the picture hats; the oil, or the turpentine or the glucose in the width of the car springs a leak and soaks the bales of woolens and domestics; the tailor has 10 bolts of cloth damaged, or says he has, by paint; and he credits his lawyer on an unpaid old bill for 50 per cent. of what he gets him to make a claim for. This loading clerk is not always honest; but he is generally loyal to what he considers his duty to his company. So he can be (and often is) perfectly oblivious of the bad order of a package. Possibly, if he is a smoker, and a case of cigars is broken, he thinks "one more box" will not be attributed to him, so he takes the chances—and incidentally a box of cigars. He isn't always careful about his "checking" into the car, but if when the goods which were on the platform have disappeared, and he finds an unchecked item or two, he makes the check-mark just the same. That the goods may be "short" at out-turn troubles him never a whit. He can with abundant reason recite that clause of the Prayer Book: "We have done the things which we ought not to have done, and we have left undone the things which we ought to have done."—S. D. Webster, St. Louis.

The estimate for double-tracking the Siberian Railroad, which the Duma has approved, is \$64,500,000, or about \$16,000 per mile. The work will be spread over a number of years.

General News Section.

The New Hampshire Railroad Commission has set September 1 as the date for a hearing on the question of express rates.

The Rock Island shops at Shawnee, Okla., report great activity and an increase in the pay of laborers from 16½ cents to 19 cents an hour.

The Minneapolis, St. Paul & Sault Ste. Marie has placed an order with the Minnesota Free Employment Bureau for 7,000 men to act as harvest hands in Minnesota and North Dakota, with wages from \$2 to \$4 a day, and board.

Reports from Springfield, Mo., say that 1,200 men in the St. Louis & San Francisco shops at that point began working nine hours a day August 3. They had been working four hours a day until July 1 and eight hours a day during July.

It is reported that all except one of the railroads entering Indianapolis have agreed to impose a uniform reconsignment charge of \$2 per car on coal originating at Indiana mines and reconsigned at Indianapolis. The rule is to become effective on September 1.

On Monday, August 3, the completed subway of the Philadelphia Rapid Transit was opened, and five-car trains are now being run from Sixty-ninth and Market streets to Second street. The trains run on a five-minute schedule and make the trip in 27 minutes.

The Long Island Railroad has made application to the Public Service Commission for authority to build a surface trolley line in Atlantic avenue, Brooklyn, from Flatbush avenue to Shepard avenue, approximately four miles. The company believes that its original franchise fully covers the requested privilege.

At the Minnesota rate hearing last week, H. A. Gray, Comptroller of the Northern Pacific, testified that since the reorganization of the road in 1896, the company has spent \$128,184,985 in improvements and new equipment. The state examiners attempted to show that the 1896 reorganization committee made \$21,000,000 profit out of the reorganization.

On August 1 the Interborough Rapid Transit subway began operating trains on the Broadway branch through to the new terminal at Van Cortlandt Park, Two Hundred and Forty-second street. This makes possible a continuous ride for a 5-cent fare from Two Hundred and Forty-second street, Manhattan, to Flatbush avenue, Brooklyn, a distance of nearly 18 miles.

Col. Melvine O. Adams, in his brief on behalf of the American and the National Express companies in the matter of the protest of the Boston Merchants' Association against the increased express rates, says that these companies lost \$34,000 during 1907 on Massachusetts business under the former schedules, and that they were therefore forced to make rate increases.

The Board of Commissioners of Leavenworth county, Kansas, has filed suit in the Leavenworth county district court to restrain the Leavenworth, Kansas & Western and the Union Pacific from removing the offices, shops and roundhouses of the former road from Leavenworth. A temporary injunction has been granted. The Leavenworth, Kansas & Western was recently purchased by the Union Pacific.

A convention of railroad men has been called to be held at the Kentucky State Fair at Louisville, Ky., on September 17. The committee in charge hopes to make this the largest assemblage of railroad men held in Kentucky for many years. On the same date a "good roads" convention will be held, and the day has been named "Highway Day." It is stated that one of the most distinguished railroad men in the country will be invited to deliver an address.

It is understood that the mechanical employees of the Canadian Pacific, western division, have voted to refuse to abide by the report of the majority of the Board of Conciliation,

which recently investigated the differences between the company and its employees. The report of the Board of Conciliation was summarized in the *Railroad Age Gazette* of July 31, page 615. The cooler heads among the employees are reported to be strongly averse to a strike.

The Erie has instituted proceedings against the Interstate Commerce Commission, alleging that the order of the commission requiring railroads to report the hours which employees work is in contravention of the fourth and fifth amendments to the Constitution of the United States, in that it compels the giving of information which might be used against the informers in a suit for alleged violation of the act of Congress limiting the hours of service of employees.

Agents of the Interstate Commerce Commission have recently been calling upon representatives of large shipping concerns in Chicago and other western cities, seeking evidence to be used by the government in the suit brought by it at Salt Lake City to dissolve the combination of the Union Pacific, Southern Pacific and allied lines. W. P. Trickett, formerly Commissioner of the Kansas City Freight Bureau, has been appointed by the government to aid it in securing evidence. The evidence being sought by the government relates mainly to the effect upon competition that has been produced by common control of these railroads.

The Atchison, Topeka & Santa Fe has appealed to the Oklahoma State Supreme Court a case in which it questions the power of the State Corporation Commission to assume jurisdiction over any matter involving the right of eminent domain or to give one railroad the right to build across the tracks of another. The Santa Fe and the Bartlesville Interurban Company were unable to agree in regard to the latter crossing the Santa Fe's tracks in Bartlesville. The interurban line took the matter before the Commission, which took jurisdiction and set a date to hear arguments. The Santa Fe asks that the Commission be prohibited from hearing the case until the question of its jurisdiction is settled.

A representative of the Travelers' Protective Association, Louisiana division, recently asked the Railroad Commission of Louisiana to require all railroads operating passenger trains in that state to furnish linen covers for seats in coaches. The Commission in ruling upon the matter says that it "is impressed with the interest taken by the complainant in the improvement of the passenger service of railroads in Louisiana," but that it was shown at the hearing that the cost of equipping coaches with linen covers ranges from \$267 to \$518 for each coach and the cost of laundry, changing and renewing comes to a material sum. As the past year has been a disastrous one for the railroads, the Commission decided to deny the petition and dismiss the case.

Corporation Counsel Pendleton has advised the New York City Public Service Commission that attempts to arrive at an agreement by the Board of Rapid Transit Railroad Commissioners with the New York Central, with regard to removing the Eleventh avenue tracks from grade, were based on a plan which did not comply with the provisions of the Saxe law, and that as the provisions of the law had not been complied with, and as the failure of the Rapid Transit Commission to begin condemnation proceedings within 12 months had made the act practically nugatory, the present commission has no power to start the condemnation proceedings provided for in the law. In other words, there is little likelihood that further efforts will be made to get the Eleventh avenue track off grade under the present legislation.

Reducing Freight Car Repairs.

To reduce the cost of freight car repairs and increase the usefulness of each car, the Pennsylvania Railroad has just issued a general notice to brakemen, repairmen and inspectors. Bumping cars together with a severe impact must be stopped, and the impact speed of cars must not exceed two miles per hour.

Brakes must be handled carefully, so that cars going over "humps" in yards will not exceed the two miles per hour when coupling. Records must be kept of all cars damaged in shifting, and these are to be carefully followed up by general foremen and master mechanics. Repairs to airbrakes and the replacing and tightening of bolts must be done in the yard by repairmen, to avoid greater damage that results from neglect. Each repairman at work in the yards is to be required to carry a kit of tools for making all manner of minor repairs. It is expected that the results from this campaign of education will be to cut down the necessity for so frequent repairs to freight cars and other equipment.

Railroad Property Burned at Chicago.

A fire which broke out about noon on August 3 in the grain district of Chicago destroyed property owned by the Chicago, Burlington & Quincy and Armour & Co. to an amount estimated at \$1,000,000, fully one-half of this loss being sustained by the railroad. The conflagration, which was the most dangerous in Chicago since the historic fire of 1871, started in the one-story dock freight house of the Burlington at Sixteenth street and the river. It is supposed to have originated from a lighted cigarette or cigar stub thrown into a quantity of chemicals stored in the shed.

Owing to the amount of combustible freight in storage at the time, the freight house was soon enveloped in flames, which, being fanned by a strong hot wind, set fire to Elevator F, just east of the freight house, and, jumping the river, attacked Elevator E. The elevators were the property of the Burlington, although operated by Armour & Co. and contained about 800,000 bu. of grain. These three structures with contents were entirely consumed. The intense heat and smoke made by the fire, combined with an atmospheric temperature of 96 deg., which is the hottest known in Chicago for seven years, made it impossible to save any of the burning buildings. Thirty freight cars, about one-half of which were loaded with freight, and nine passenger cars, including three coaches, three baggage cars, two mail cars and one chair car, all belonging to the Burlington, were burned. It is stated that from 30 to 50 additional freight cars belonging to other roads were also consumed, but we are unable to get any definite verification before going to press.

The loss is estimated in the following table:

Dock freight house (not including contents) ..	\$50,000
Elevators (two)	300,000
Thirty freight cars	35,000
Seven passenger cars	40,000
Contents of freight shed, damage to tracks, etc.	75,000
Armour & Co.	500,000

Estimated total\$1,000,000

All traffic on the roads entering the Union and Grand Central stations was blocked for some time, until the tracks could be raised and the hose placed under them.

Conference Regarding Nine-Hour Law.

The controversy between the Chicago, Rock Island & Pacific and the telegraphers in its employ has resulted in recourse to that portion of the Erdmann Act that provides for mediation and conciliation. It is understood that the main issue between the railroad and its employees is one involving the interpretation of the federal hours of service law, which the Rock Island has applied to its telegraphers' schedule in such a manner as to disturb as slightly as possible the working conditions.

As an example of the application of the law at offices operated both day and night, where two men had been employed 12 hours each per day, with one hour for dinner, the spread of the hours of service of these employees was maintained, and the two hours which the law prohibits the men from working withdrawn from the day's service at such times as were most consistent with conditions and most economical from the company's standpoint. In other words, the operators at these offices go to work in the morning, or evening, and quit in the evening or morning, at the same hours as under the old working arrangement, but have two hours more off duty in the middle of the day or night than formerly, the result being that operators at offices operated both day and

night are working nine hours with no change in the rate of pay, notwithstanding the decrease in the hours of service. It is understood that the Telegraphers' Committee contends that under the law telegraphers must work consecutive hours. The obvious aim of the railroad companies is to get along with employing as few additional men as possible and yet properly cover the service, and the equally obvious aim of the men is to force the employment of more telegraphers. No statement of the result of the conference has been made public, and it is understood that the meditation has been continued, due to engagements of Charles P. Neill, Commissioner of Labor, until some time next week.

Hamburg-American Pier Burned.

On July 31 the Hamburg-American line pier on South Delaware avenue, Philadelphia, was burned. A train of burning freight cars was pulled off the pier during the fire.

Interest and Dividends.

Interest and dividends payable by leading corporations in August will amount to \$72,263,161. In 1907 the interest and dividends paid in August by the same corporations amounted to \$74,407,673. There is a decrease of \$3,644,512 in dividend payments and an increase of \$1,500,000 in interest payments, because of new issues of bonds and notes.

Electric Headlights in Georgia.

The Georgia House has passed a bill which comes up for final action in the Senate this week, requiring all engines used in traffic on main lines in the state to be equipped with electric headlights. The passage of this bill has been strongly advocated by the Brotherhood of Locomotive Engineers.

Nickel-in-Slot Cars for New York.

Receiver Whitridge has ordered from J. G. Brill & Co., of Philadelphia, 150 pay-as-you-enter cars for use on the Third Avenue Railroad System in New York. These cars will be similar in general type to the pay-as-you-enter cars now operated on the Madison avenue line; but they will have cash boxes into which the nickel is to be dropped upon entering the car.

Drastic Action in Pennsylvania.

The Pennsylvania State Railroad Commission has ordered the Ohio River Junction Railroad Co. to provide its single locomotive with a cowcatcher and a headlight. The railroad company is debating whether or not this can be considered a cruel and unusual penalty.

Pennsylvania Railroad Discipline.

The Pennsylvania Railroad now posts decisions on discipline on the employees' bulletin boards, and the press agent gives out some of the items from the Philadelphia terminal division. An employee detected stealing was dismissed; one who gave misleading statements in connection with securing leave of absence was suspended ten days; others for failing to make proper inspection of and repairs to cars were suspended four days. An employee who disregarded a signal in the stop position was suspended 42 days; another was suspended 30 days for carelessness resulting in damage to cars. Numerous firemen, who, by careless firing of engines, burned too much coal and caused unnecessary smoke, were suspended for two days. Where, through an error of judgment, an employee is responsible for an accident resulting in slight damage to cars or engines, it is not the practice to impose severe discipline unless the records indicate that the employee is habitually careless. An employee whose service, judging by his record, is not what it should be, is called to the Superintendent's office, and, after a review of his record, he is notified that immediate and marked improvement must be shown. If the employee replies that he is doing the best he can his

attention is called to the fact that the position he occupies carries with it certain responsibilities, and that if his best is not equal to those responsibilities he will either be given some other position or dismissed from the service.

Traffic News.

The chairman of the Western Classification Committee has announced that minimum carload lots will be increased to 30,000 lbs.

Philadelphia grain shippers are dissatisfied with the new form of bill of lading recommended by the Interstate Commerce Commission, and are urging a protest.

The daily average of passengers carried for July by the Metropolitan Elevated of Chicago was 131,152, a decrease of 4,627, and by the South Side Elevated 114,362, an increase of 2,429.

The Virginia Car Service Association reports that 66,300 cars were handled in June, making that the highest month since December, excepting only April, when 69,789 cars were handled.

The Alabama commission has asked the Mississippi commission to join it in a movement to prevent the proposed general advance in rates on certain classes of freight from points in the Mississippi and Ohio river territory, for which the tariff associations have declared.

The Railroad Commission of Louisiana has issued an order authorizing the steamboat lines operating on the Mississippi river and its tributaries in Louisiana to advance their rates on live stock between points on the Mississippi river and on the Atchafalaya, Old, Black and Ouachita rivers.

The Rock Island system has granted the application for a second series of the reduced merchants' rates from the West and Southwest to New York. The rates will be in effect to New York on August 15 to 19 inclusive, with a rate limit to September 13 on the basis of a fare and a half for the round trip.

Traffic and transportation officers of the Texas lines will hold a quantity of the article to be shipped as great as the purpose of outlining plans for facilitating the handling of the Texas cotton crop this year. A similar meeting was held last year and the results, it is stated, proved so satisfactory that such a meeting may be held every year.

Fifty members of the traffic department of the Wisconsin Central are making a business and inspection trip over the entire system as guests of the management. Besides the higher officers, the party includes assistants to the freight and passenger agents and also the contracting, traveling and district freight and passenger agents and the commercial and general agents.

On New York Central train No. 55 (Adirondack, Thousand Islands and Montreal Express), 26 extra sleeping cars were run last Friday night, making a total of 35 sleeping cars for the entire train. This is next to the largest number which the company has ever hauled on one train, run, of course, in sections. Last Labor Day the Montreal Express brought in 44 sleeping cars.

Upon application of the defendants in the Pacific lumber cases, the Interstate Commerce Commission has extended the effective date of its order from August 15 to October 15. This action was taken upon the showing made by the railroads that the number of rates involved was so great that it would be an impossibility to check them up and print and file the new tariffs within the time originally granted.

The Indiana Railroad Commission has sent out circulars to the traffic managers of steam railroads and interurban lines, calling their attention to the new forms of bill of lading which have been suggested by the Interstate Commerce Commission for use in interstate business and indicating that when changes are made in the bills of lading for local business in Indiana the new forms should be based as nearly as possible on those suggested by the Interstate Commission.

A. J. Glauque, agent of the Michigan Central at Detroit,

Mich., has been elected by the executive committee of the American Association of Local Freight Agents' Association as President of this organization, to succeed C. W. Nash. Mr. Nash, who was elected President of the Association at its last annual meeting, has been promoted to the position of General Freight Agent of the Delaware & Hudson, which terminates his membership in the organization.

Judge Cotterall of the federal court issued an injunction at Enid, Okla., on July 29, temporarily restraining the Attorney-General and the Superintendent of the State Liquor Dispensary of Oklahoma and officials of certain counties, from seizing shipments of liquor in transit in Oklahoma until such shipments shall have been delivered to the consignees. He held that to seize a shipment before it is delivered to the consignee is an unlawful interference with interstate commerce.

Attorney-General Byers of Iowa has prepared an opinion for the State Railroad Commission, in which he holds that the Iowa law requiring common carriers to weigh coal at the destination or at the nearest point to destination "at a reasonable rate of not more than \$1.00 per car," is applicable to interstate as well as to intrastate shipments. Officers of the Illinois Central had taken the position that they had the right to impose a charge of \$3.00 per car for weighing interstate shipments.

Mrs. M. E. Richards, a ticket broker, has been arrested at Denver, Colo., for aiding in and abetting the illegal use of a railroad pass in violation of the Interstate Commerce Act. The pass was originally issued by the Chicago, Burlington & Quincy to R. E. Wayland on the request of the Missouri, Kansas & Texas, and was for a trip from Omaha to Denver and return. The pass got into the hands of Mrs. Richards, and she sold it at a reduced rate to L. E. Varner, who used it from Denver to Omaha. Varner, when arrested, agreed to give testimony against Mrs. Richards.

On August 5 the trainmen on Long Island suburban trains distributed circulars asking commuters to vote on proposed changes in the fall time-table. The circular said that to meet the changed conditions caused by the electric operation on Atlantic avenue, in connection with the subway, and to give regular daily riders the benefit of the saving in time at home, it was proposed to schedule commutation trains to leave the eastern terminals 10 to 15 minutes later in the morning and to leave the western terminals 10 to 15 minutes earlier in the afternoon. The circulars contained blanks for a vote on each of these propositions.

The Receivers and Shippers' Association of Cincinnati has forwarded a communication to President Roosevelt asking him to cause the Attorney-General to bring proceedings for alleged contempt against a number of railroads in that section of the country, which the association claimed were permanently enjoined by Judge Foster, of the circuit court, on June 7, 1897 (trans-Missouri case), from agreeing, combining, conspiring or acting together to monopolize the freight traffic between states. The association holds that the proposed advance in freight rates clearly demonstrates an agreement contrary to the spirit of the court's decision.

The Board of Railroad Commissioners of Iowa has announced that on August 19, at its offices in Des Moines, it will hold a public hearing for the purpose of making such changes in its classification of freight as may appear just and reasonable. Among other things, the Commission will consider the advisability of making the following rules: "When cars furnished by carriers in response to shippers' requests do not, on account of dimensions or condition of the car, hold a quantity of the article to be shipped as great as the minimum weight specified in the classification, charges shall be assessed on the actual weight hauled."

The Railroad Commission of Arkansas has filed in the federal circuit court a general denial to the allegations made in the petition of the St. Louis Southwestern, the St. Louis, Iron Mountain & Southern and of stockholders of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco for an injunction to restrain the Commission from enforcing the reduced passenger and freight rates fixed by law in Arkansas. Judge Van Devanter in St. Paul on July 29 set the hearing of the case for August 31. The complainants attack the rates

fixed as confiscatory and the penalties fixed for violation of the laws as so excessive as to be unconstitutional.

The Public Belt Railroad, which is owned by the city of New Orleans, La., was opened for traffic on Aug. 3, but did no business. The Public Belt Railroad on July 29 made application to the Interstate Commerce Commission for authority to begin operation on Aug. 3 and filed its schedule of rates by wire, but the Secretary of the Interstate Commerce Commission promptly advised that the rates must be filed 30 days in advance of going into effect. In view of this ruling of the Commission, the railroads entering New Orleans refused to turn over to the Public Belt Railroad any cars, and the belt line, lacking the equipment of its own, was unable to do any business.

F. A. Leland, Chairman of the Southwestern Tariff Committee, has invited furniture manufacturers and shippers and dealers in woodenware, tin cans and other articles of a bulky nature to attend a conference in St. Louis on September 1, at which the Tariff Committee will hear complaints of shippers against the proposed advance by the railroads of minimum weights in carload lots. The shippers who intend to attend the conference are requested to furnish the railroads in advance with the car number and initials of that car and description, contents and actual weight of their shipments to Texas, Arkansas, Louisiana and Oklahoma points during the year ended July 1, 1908.

Chairman Mayfield, of the Railroad Commission of Texas, Assistant Attorney-General Pollard and United States Senator Culberson of that state will appear before the Interstate Commerce Commission at Washington to protest against the advance in interstate freight rates to Texas points, which has been announced by the Southeastern lines, to become effective on August 10. The decision that this should be done was made by the adoption of a motion made by Mr. Mayfield at a meeting of the Railroad Commission. The substance of the motion of Mr. Mayfield was communicated to the Railroad Commission of Arkansas and the Corporation Commission of Oklahoma, with the request that they take action similar to that of the Texas Commission.

On August 4 the New York steamship lines, which recently appealed to the railroads to reduce their grain rates to allow the ports of New York, Boston, Philadelphia and Buffalo to meet the competition of Montreal, appointed a committee to meet that of the Trunk Line Association, August 6. P. A. S. Franklin, Vice-President of the International Mercantile Marine, says that there has not been a bushel of grain shipped from New York to London in four months. Grain can be shipped from Georgian bay points through to Montreal for 3½ cents a bushel, including elevator charges in that city; whereas it costs 5½ cents to send it from Buffalo to New York without elevator service. The difference between New York and Montreal rates for five characteristic ports is given by Mr. Franklin as follows:

	Per bushel—	
	From Montreal.	From New York.
Antwerp	\$0.0525	\$0.0525
Avonmouth .....	.0562½	.042
Hull .....	.06	.042
Liverpool .....	.0525	.0315
London .....	.045	.0345

Traffic and legal officers of the western lines and representatives of the jobbers at Chicago and at St. Louis and other Mississippi river points have been in conference at Chicago during the past week regarding the action to be taken in reference to the decision of the Interstate Commerce Commission in the so-called Missouri river jobbers' case (Burnham, Hanna, Munger Dry Goods Co. et al v. C. R. I. & P. et al). All the interests mentioned are keenly dissatisfied with the decision. Legal representatives of the roads were sent recently to Cedar Rapids, Ia., to confer informally with Commissioner E. E. Clark, and early this week H. C. Barlow, Executive Director of the Chicago Association of Commerce, visited him. Mr. Clark indicated to his visitors that it would probably be futile for the Commission to give a rehearing in this case, as its members had made up their minds definitely that the proportions of the through rates on seaboard business between the Mississippi and Missouri river should be lower than the local rates between the rivers. While no final determination has been reached, it is very probable that the railroads and the

jobbers at Chicago and Mississippi river points will appeal from the decision of the Commission to the courts.

Newspaper reports to the effect that the Union Pacific will contest in the courts the ruling of the Interstate Commerce Commission prohibiting it from paying further allowances to the Peavey Grain Company for the elevation of its own grain at Missouri river points, are misleading. The Union Pacific, as stated in the *Railroad Age Gazette*, of July 17, page 544, has decided to comply with the Commission's order. It is anticipated, however, that the Peavey Grain Company will bring suit against the Union Pacific to compel it to comply with its contract, providing for the payment of allowances. The Union Pacific, therefore, will publish in the tariffs filed by it with the Commission a provision to the effect that it will discontinue the payment of allowances until and unless they shall finally be held by the courts to be legal. The Union Pacific takes this action because if it did not provide for the payment of the allowances and they should be finally held legal, it would be in the peculiar position of being unable to pay the allowances because it had not provided for them in its tariffs, while at the same time it would be liable for their payment because the contract had been held to be binding. The attention of the Interstate Commerce Commission has been called to the provisions in the tariffs and it is understood that the Commission does not object to them.

INTERSTATE COMMERCE COMMISSION.

The Weight of Precedent.

The Banner Milling Co. et al. v. the New York Central & Hudson River. Opinion by Commissioner Prouty.

The purpose of this proceeding is to obtain the benefit of the decision of the commission in certain previous cases, among others, the *Banner Milling Co. v. New York Central & Hudson River*; *Thornton & Chester Milling Co. v. The Delaware, Lackawanna & Western*, in which the rate on grain and flour from western points was held to be excessive. While there is in the nature of things no estoppel of record in proceedings before this body, the commission must of necessity when it reaches a conclusion upon a given set of facts adhere to that conclusion unless some new facts or changed conditions are brought before its attention or unless it based its decision upon some misconception. The present rates on flour and other grain products from Buffalo, N. Y., to New York, of 11 cents per hundred lbs., 13 cents to Boston and 13½ cents to Sherbrooke, are excessive and should not exceed 10 cents to New York, 12 cents to Boston and 12½ cents to Sherbrooke.

Charge for Unloading Fruit Upheld.

Wholesale Fruit and Produce Association v. the Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Prouty.

The complaint alleges that previous to January 1, 1908, the defendants loaded and unloaded at their own expense carloads of fruits and vegetables at Chicago, when the carloads were shipped in packages, but since then they have compelled the shippers to bear the expense of this loading and unloading. Where carload shipments are to a consignee who is the owner of the entire contents of a car and delivery is made upon the team tracks of the defendant, the defendants should furnish the necessary means of bringing the packages to the car door. The consignees cannot be compelled to go inside of the car to get their packages, but the defendant is under no obligation to furnish a place for assorting and distributing these packages. Where a freight house is furnished the unloading on a fruit platform or into the house, where the entire amount of the work must be done by the railroad company from the nature of the work, a charge of 1c. per hundred pounds is reasonable for these services. It cannot be said as a matter of law that it is the absolute duty of carriers to unload carloads of package fruit, nor that this duty rests upon the shipper because there is no hard and fast rule as a law on this subject. Each commodity and each case must be considered separately and a decision arrived at as to what is just and reasonable by taking into consideration the matters that affect the particular case and possibly the general custom of handling the commodity in question.

REPORT OF EARNINGS AND EXPENSES OF RAILROADS.

MONTH OF JUNE, 1908.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses			Total operating expenses.	Net operating (or deficit).	Operating income (or loss).
		Freight.	Passenger.	All other operations from trans- portation.	Total revenue.	Maintenance of way and structures.	Of equip- ment.			
Bessemer & Lake Erie	201	\$444,968	\$23,101	\$113*	\$468,172	\$58,125	\$42,336	\$6,405	\$230,108	\$238,874
Chicago & Alton	1,051	1,633,186	303,071	4,408	2,340,665	856,018	298,930	24,764	1,351,752	1,988,913
Chicago & North-Western	7,932	2,062,264	1,400,368	35,059	3,537,691	1,238,344	298,930	10,137	2,883,722	653,969
Chicago, Lake Shore & Eastern	230	844,491	303,435	3,315	1,151,241	335,249	111,284	1,170	1,925,998	1,705,175
Chicago, St. Paul, Minn. & Omaha	1,311	2,702,252	367,943	3,471	3,073,666	1,032,927	111,284	23,477	2,940,148	99,298
Cleveland, Akron & Columbus	162	97,724	30,771	8,718	137,213	33,418	18,459	3,291	330,299	272,229
Cumberland Valley	162	146,758	44,925	2,533	194,216	50,048	15,682	3,783	46,670	272,229
Delaware & Hudson	842	1,213,558	290,374	38,919	1,542,851	492,422	133,452	6,889	1,111,284	431,567
Delaware, Lackawanna & Western	893	2,173,882	260,791	163,636	2,598,309	838,338	337,724	5,472	1,583,102	1,015,207
Detroit & Mackinac	344	2,173,882	260,791	163,636	2,598,309	838,338	337,724	5,472	1,583,102	1,015,207
Detroit & Iron Range	168	532,720	18,824	3,127	554,671	78,004	37,721	2,406	311,221	243,450
Duluth, Missabe & Northern	237	943,157	25,624	3,633	972,414	102,360	28,827	6,160	307,222	665,192
Elgin, Joliet & Eastern	565	1,691,010	86,016	2,139	1,779,165	510,360	28,827	6,160	307,222	665,192
El Paso & Southwestern Co.	582	1,744,435	119,657	4,433	1,868,525	551,844	56,896	15,915	343,746	152,779
Grand Rapids & Indiana	822	444,459	164,515	45,617	654,591	164,515	56,896	15,915	343,746	152,779
Kansas City Southern	724	244,254	61,356	10,833	316,443	50,921	78,220	22,558	403,822	292,352
Lake Erie & Western	931	217,198	52,816	16,292	286,306	78,420	130,757	10,702	133,840	152,466
Maine Central	1,746	282,388	257,846	43,096	583,330	134,809	100,370	20,065	643,025	340,305
Michigan Central	1,746	282,388	257,846	43,096	583,330	134,809	100,370	20,065	643,025	340,305
Missouri, Kansas & Texas	2,072	1,208,132	231,483	9,409	1,449,024	226,326	217,949	732,911	1,286,939	636,485
New York, Ontario & Western	1,112	1,178,825	231,483	9,409	1,449,024	226,326	217,949	732,911	1,286,939	636,485
Norfolk & Western	1,112	1,178,825	231,483	9,409	1,449,024	226,326	217,949	732,911	1,286,939	636,485
Norfolk & Western	1,112	1,178,825	231,483	9,409	1,449,024	226,326	217,949	732,911	1,286,939	636,485
Pennsylvania Co.	4,414	2,637,605	500,032	268,119	3,405,756	1,101,061	143,880	11,216	1,976,956	1,428,800
Pennsylvania R. R. Co.	4,066	2,637,605	500,032	268,119	3,405,756	1,101,061	143,880	11,216	1,976,956	1,428,800
Philadelphia, Baltimore & Washington	714	7,767,473	239,747	157,416	8,164,636	1,853,748	29,429	33,891	1,049,922	7,114,714
Pittsburgh & Lake Erie	191	728,941	535,387	24,923	1,289,251	312,748	89,429	17,300	424,468	864,783
Pitts., Cincinnati, Chicago & St. Louis	1,472	1,711,823	693,772	288,401	2,693,996	312,748	89,429	53,769	1,726,787	967,209
Rutland	468	1,125,116	27,628	3,792	1,156,536	42,052	28,854	5,324	158,156	1,008,380
Toledo, St. Louis & Western	451	229,064	35,873	2,593	267,430	42,052	28,854	5,324	158,156	1,008,380
Vandalia	829	426,628	181,857	3,091	611,576	116,347	103,772	19,808	179,734	431,842
West Jersey & Seashore	371	120,700	305,835	2,469	428,944	66,216	35,175	11,092	317,292	107,652

*Loss.

†Includes canal expenses \$33,736.

‡Includes canal expenses \$509,190.

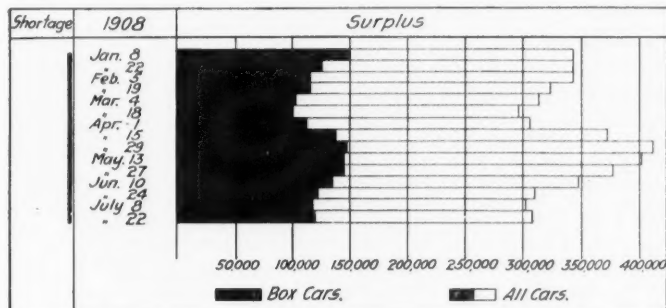
TWELVE MONTHS OF FISCAL YEAR, 1908.

Bessemer & Lake Erie	201	\$4,964,502	\$293,536	\$73,137	\$5,331,175	\$756,925	\$905,496	\$1,545,004	\$2,223,926	\$2,077,460
Chicago & Alton	1,051	1,671,417	1,571,410	5,043,777	4,246,604	1,586,346	1,538,560	1,586,346	1,586,346	1,586,346
Chicago & North-Western	7,932	4,349,630	3,011,407	5,043,777	12,404,814	3,856,416	1,034,590	1,034,590	1,034,590	1,034,590
Chicago, Lake Shore & Eastern	230	844,491	303,435	3,315	1,151,241	335,249	111,284	1,170	1,925,998	1,705,175
Chicago, St. Paul, Minn. & Omaha	1,311	2,702,252	367,943	3,471	3,073,666	1,032,927	111,284	23,477	2,940,148	99,298
Cleveland, Akron & Columbus	162	97,724	30,771	8,718	137,213	33,418	18,459	3,291	330,299	272,229
Cumberland Valley	162	146,758	44,925	2,533	194,216	50,048	15,682	3,783	46,670	272,229
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Delaware, Lackawanna & Western	893	2,173,882	260,791	163,636	2,598,309	838,338	337,724	5,472	1,583,102	1,015,207
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Detroit & Iron Range	168	532,720	18,824	3,127	554,671	78,004	37,721	2,406	311,221	243,450
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Missouri, Kansas & Texas	2,072	1,208,132	231,483	9,409	1,449,024	226,326	217,949	732,911	1,286,939	636,485
New York, Ontario & Western	1,112	1,178,825	231,483	9,409	1,449,024	226,326	217,949	732,911	1,286,939	636,485
Norfolk & Western	1,112	1,178,825	231,483	9,409	1,449,024	226,326	217,949	732,911	1,286,939	636,485
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Pennsylvania Co.	4,414	2,637,605	500,032	268,119	3,405,756	1,101,061	143,880	11,216	1,976,956	1,428,800
Pennsylvania R. R. Co.	4,066	2,637,605	500,032	268,119	3,405,756	1,101,061	143,880	11,216	1,976,956	1,428,800
Philadelphia, Baltimore & Washington	714	7,767,473	239,747	157,416	8,164,636	1,853,748	29,429	33,891	1,049,922	7,114,714
Pittsburgh & Lake Erie	191	728,941	535,387	24,923	1,289,251	312,748	89,429	17,300	424,468	864,783
Pitts., Cincinnati, Chicago & St. Louis	1,472	1,711,823	693,772	288,401	2,693,996	312,748	89,429	53,769	1,726,787	967,209
Rutland	468	1,125,116	27,628	3,792	1,156,536	42,052	28,854	5,324	158,156	1,008,380
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West Jersey & Seashore	371	120,700	305,835	2,469	428,944	66,216	35,175	11,092	317,292	107,652

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency, has issued, under date of July 30, Statistical Bulletin No. 27 A, giving surpluses and shortages of freight cars from October 30, 1907, to July 22, 1908. Mr. Hale says:

"The total surplus shows an increase of 5,120 over the fig-



Car Surpluses and Shortages in 1908.

ures for July 8, of which 3,406 are in box cars and 1,466 in coal and gondolas. Against this increase, the first since April 23, we have reports showing a decrease of 3,000 in the number of bad order cars, making a net increase of only about 2,000 in the grand total of idle cars. Any marked improvement in

portion of the foreign rate were reasonable the domestic rate must be excessive. The Oriental business has been comparatively small and the railroads could better afford to go out of that business entirely than to stay in it if the adoption of this latter alternative should cause successful attacks to be made on their domestic rates. Railroad traffic men contend that, anyway, the exporter has no interest in the rail portion of the through rate, his interest being confined to the total through rate.

On inbound business proportional rates will continue to be applied, which will not differ materially from those which have been in effect.

The railroads have tried in vain to get the Interstate Commerce Commission to change its attitude in the matter of rates on foreign business. H. C. Barlow, executive director of the Chicago Association of Commerce, is now endeavoring to bring about some adjustment whereby the harm anticipated by shippers from the adoption of the plan of the railroads may be avoided.

R. P. Schwerin, General Manager of the Pacific Mail Steamship Company, is quoted as having said in a newspaper interview at San Francisco that owing to the decision of the transcontinental railroads "a very serious situation confronts the water carriers on the Pacific, excepting the subsidized lines; or, in other words, the Japanese lines. We handled approximately 120,000 tons a year. I don't think that after the new rates go into effect we shall handle 20,000 tons a year."

Commissioner E. E. Clark, of the Interstate Commerce Com-

CAR SURPLUSES AND SHORTAGES, BI-WEEKLY, FROM OCTOBER 30, 1907, TO JULY 22, 1908, INCLUSIVE.

Date.	Number of roads.	Surpluses.				Shortages.				Total.
		Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	509
July 8, 1908	163	117,174	19,715	124,273	42,398	303,560	289	33	28	518
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	125
April 29, 1908	159	147,971	24,350	186,742	54,542	413,605	145	42	16	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	1,249
January 22, 1908	161	124,622	27,328	142,338	48,292	342,580	392	132	79	735
December 24, 1907	158	87,714	14,740	64,556	42,300	200,310	187	81	191	724
November 27, 1907	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	17,964
October 30, 1907	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	90,757

the situation could hardly be looked for in July, which is normally a light month. The figures for 1907 show the car surplus to have been higher in July than during any period prior to the depression which set in early in November."

Transcontinental Lines and Oriental Business.

Various reports have been printed recently in the daily newspapers to the effect that the transcontinental railroads are "going out of" traffic to the Orient. The basis for these reports is the fact that the transcontinental lines have prepared tariffs which will go into effect on October 31 that contain no through rates or portions of through rates on outbound business to the Orient. After that date the transcontinental lines will apply on outbound business to the Orient their through full local rates to the Pacific coast, except on cotton, on which substantially the same through rates as heretofore will be applied, the rail portions of which will be published and filed.

The effect of the application by the transcontinental lines of their full local rates to the Pacific will be to make the rates via the rail lines and the Pacific ocean considerably higher than via the Suez canal, and it is naturally anticipated that after the change becomes effective the bulk of the business will move via the latter route. The fundamental reason why the transcontinental lines have determined not to make through rates on transcontinental business is their indisposition to publish the rail portions of the rates applied. It is well known that the rail portions of the through rates have in the past been much lower than the domestic rail rates on business to the Pacific coast. The rail portions of the through rates are required by the Interstate Commerce Commission to be published. Traffic men contend that this would at once subject their domestic rates to attack. Shippers would point out that the foreign business and the domestic business to the coast were handled under precisely the same conditions and at the same transportation cost, and would contend that if the rail

mission, gave an interview at his home in Cedar Rapids, Ia., on August 1, in which he said:

"The export and import traffic in question originates at or is destined to the more thickly settled section of the country, of which Pittsburgh is fairly illustrative. This traffic, when moved through the Pacific ports, must move in competition with the lines via the Atlantic ports and the Suez canal. Moving it through the Atlantic ports involves a rail haul of between 400 and 500 miles. Moving it through the Pacific ports involves a rail haul of 2,300 or 2,400 miles, and therefore the rates received on it by the rail carriers to the Pacific ports are necessarily low.

"It has long been customary, and is still, for the rail carriers to charge less for the rail haul on import and export traffic than they charge on domestic traffic hauled between the same points. Some of the news dispatches have stated that the commission had ruled that this was improper or unlawful. That statement is wholly in error. The commission has announced no such view; in fact, that question was determined by the Supreme Court of the United States several years ago in the import rate case. All that the commission has insisted upon in this connection is that the carriers shall comply with the plain requirements of the law and publish and submit to public inspection their rates, fares and charges upon the business which they transport. It is the unwillingness of the transcontinental roads to make public the earnings which they accept for the rail haul on this import and export traffic that leads to the threat that they will go out of that business, and comparison of their rates and charges upon the same commodities when destined to points in the United States on and near the Pacific coast would be so significant that attack upon the reasonableness of the domestic rate is feared.

"As to turning over the transpacific ocean traffic to the Japanese lines, it is to be noted that the Great Northern Railway Company has one steamship plying between Puget Sound and Oriental ports; the Northern Pacific has traffic arrange-

ments with a British line; the Southern Pacific controls the Pacific Mail Steamship Company, but has not enough boats to maintain regular sailings, and for a long time has worked under an arrangement with a Japanese subsidized steamship line. The amount of revenue to American railways that is involved in this question has been greatly overstated.

"If export and import traffic to foreign countries not adjacent is to be exempt from the requirement that the rail carriers shall make public and observe without discrimination all their rates, fares and charges, it seems clear that it will have to be so provided by Congress."

Cotton Conditions.

The Department of Agriculture finds that the average condition of cotton on July 25, 1908, was 83.0 per cent. of a normal, as compared with 81.2 on June 25, 1908; 75.0 on July 25, 1907; 82.9 on July 25, 1906; 74.9 on July 25, 1905, and 81.4 the average of the condition on July 25 of the past ten years.

The condition of cotton on July 25, 1908, with comparisons by states, follows:

States.	June 25				Per cent. of U.S. acreage in state.
	1908.	1907.	1906. average.	10-yr. June 25, 1908.	
Virginia	90	65	83	83	...
North Carolina	89	75	75	81	5
South Carolina	84	81	72	80	8
Georgia	85	81	74	81	15
Florida	85	84	72	84	1
Alabama	85	72	83	81	11
Mississippi	86	71	88	80	10
Louisiana	83	71	88	82	5
Texas	82	75	86	82	30
Arkansas	86	68	89	82	6
Tennessee	88	75	88	84	2
Missouri	88	66	95	84	7
Oklahoma	66	74	88	85	7
United States	83.0	75.0	82.9	81.4	100

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Isthmian Canal Commission will receive bids until August 13 for 10 locomotives.

CAR BUILDING.

The Chicago & Alton is in the market for 1,000 steel gondola cars.

The Harriman Lines are asking prices on from 4,000 to 7,000 freight cars.

The Isthmian Canal Commission will receive bids until August 13 for 50 dump cars.

The Atlantic Coast Line is asking prices on 1,000 steel under-frame box and refrigerator cars.

The Third Avenue Railroad, New York, has ordered 150 pay-as-you-enter cars from the J. G. Brill Co.

The Wisconsin Central is asking prices on 2,550 miscellaneous cars, including passenger, box, gondola and flat cars.

The St. Louis & San Francisco has placed an order with the American Car & Foundry Co. for repairing 1,000 miscellaneous cars.

The Newburgh & South Shore, it is said, will soon be in the market for 275 freight cars. This item has not yet been confirmed.

The Toledo & Ohio Central is in the market for three observation passenger cars and one combination passenger and buffet car.

The Oil Belt Traction, which, as noted in our Railroad Construction columns this week, is being surveyed, will, it is said, buy its motor cars from the new McKeen Motor Car Co., Omaha, Neb.

The Chicago & North-Western is said to have ordered 1,000 freight cars, dividing the number among the Pullman Car

Co., the American Car & Foundry Co., and Haskell & Barker. This item is not confirmed.

The Delaware, Lackawanna & Western is said to have ordered 300 steel hopper cars from the American Car & Foundry Co., for September delivery, the cars to be built at the Berwick plant. This item is not confirmed.

IRON AND STEEL.

The Boston & Maine has ordered 7,000 tons of rails from the Lackawanna Steel Company.

The National Lines of Mexico have ordered 20,000 tons of rails from the Monterey Iron & Steel Co.

The Boston & Maine has ordered 7,000 tons of rails from the Lackawanna Steel Co. for early delivery.

The Chesapeake & Ohio has ordered 10,000 tons of rails from the Carnegie Steel Co. and the Maryland Steel Co.

The Toledo & Ohio Central, it is said, has ordered 2,000 tons of fabricated steel for the construction of new bridges.

The Denver, Laramie & Northwestern has ordered rails from the Colorado Fuel & Iron Co. (See this railroad under Railroad Construction.)

The Kanawha & Michigan has ordered 2,000 tons of structural steel from the American Bridge Co. to be used in building a bridge at Point Pleasant, W. Va.

RAILROAD STRUCTURES.

BOSTON, MASS.—A local press report says that plans are being completed for the Dudley street station of the New York, New Haven & Hartford, and that work will begin at once.

CAIRO, ILL.—The Illinois Central has awarded the contract to Peter Etling, Ashley, Ill., for remodeling the passenger station and for erecting two additions to it.

CAMPBELLTON, N. B.—The contract for building the new freight shed to replace the one destroyed by fire in October, 1907, has been let to Goulert & Culligan.

CHIHUAHUA, MEX.—Work of building the 850-ft. steel bridge of the Kansas City, Mexico & Orient over the Conchos river is to be completed next month. It is said that there are only four more concrete piers to be built and that this work has progressed at the rate of a pier a week. (R. R. G., May 8, p. 654.)

ENAVILLE, IDAHO.—The Idaho Northern will build a passenger station here.

GREENBURG, IND.—Plans for a new passenger depot at Greenburg are being prepared by Henry J. Schlacks, Borden block, Chicago, for the Cleveland, Cincinnati, Chicago & St. Louis. It will be a one-story structure, 112 ft. long and 48 ft. wide, costing about \$18,000. The building will be of pressed brick and stone. Bids will be received the latter part of August and work will commence early in September.

NORTH BAY, ONT.—The Grand Trunk and the Temiskaming & Northern Ontario will jointly build a union station and freight yards.

QUEBEC, QUE.—The government has taken over the undertaking, assets, property and franchises of the Quebec Railway & Bridge Co., and will build the Quebec bridge which collapsed while under construction a year ago.

ST. ALBANS, W. VA.—The Chesapeake & Ohio has purchased a tract of land at St. Albans, on which it is reported it will erect shops to repair the equipment of the Coal River Railway.

SEGUIN, TEX.—The Galveston, Harrisburg & San Antonio has given the Houston Company, Houston, Tex., the contract for erecting a passenger station to cost \$12,000.

SPRINGFIELD, OHIO.—The Cleveland, Cincinnati, Chicago & St. Louis is having plans prepared by Henry J. Schlacks, Borden block, Chicago, for a new passenger station to cost about \$100,000. The proposed building will be 308 ft. long, 67 ft. wide and two stories high, surmounted by a copper-covered tower. It will have a concrete foundation, steel superstruc-

ture and exterior of brick and cut stone. It will probably be two or three months before bids are asked.

WAXAHACHIE, TEX.—The Missouri, Kansas & Texas is said to have authorized the building of a new passenger station.

SIGNALING.

Proposals for the installation of block signals for the elevated railroad tracks on the Williamsburgh bridge (East river, New York City) were received too late to comply with the law, and bids have been re-advertised, for Aug. 11, at 2 p.m. All bids must be enclosed in sealed envelopes, endorsed "Bid for the construction of the block signals for the Elevated Railway tracks of the Williamsburgh (new East river) bridge, over the East river, between the Boroughs of Manhattan and Brooklyn," and addressed to the Commissioner of Bridges, Park Row building, New York. The specifications call for 12 signals, nine home and three distant, of cast iron; the home signals showing red and green, the distant signals showing yellow and green. The signals and lenses are to be similar in all respects to those in use on the Brooklyn bridge, and are to be designed for 230-volt, 25-cycle, alternating-current, which will be furnished to the signal mains at the subway station lighting switchboard, Delancey and Clinton streets, Manhattan.

SUPPLY TRADE NOTES.

F. D. Laughlin, Eastern Sales Manager of the Pittsburgh Pneumatic Co., New York, has resigned.

The United States Equipment Co., Chicago, has changed its name to the Sheffield Car & Equipment Co.

F. T. Hyndman, Manager of the Railroad Department of the Eldo Co., New York, has resigned. Mr. Hyndman was formerly Mechanical Superintendent of the New York, New Haven & Hartford.

John D. Ingram, for the past ten years Superintendent of the Jeffersonville plant of the American Car & Foundry Co., New York, died on July 25 of pneumonia, following an operation for appendicitis.

Carl F. Lunkenheimer, Vice-President of the Lunkenheimer Company, Cincinnati, Ohio, died on July 19 in Pasadena, Cal. He had gone to Pasadena in 1904 in search of health and had since made his home there.

R. D. Tyler, formerly Division Engineer of the Franklin & Clearfield, has resigned to go to the Bernard Crockery Co., 1544 Blake street, Denver, Colo. Mr. Tyler has been on construction work on the New York Central Lines since 1902. He is an associate member of the American Society of Civil Engineers.

Bids will be received until August 7 by the Isthmian Canal Commission for one single and six duplex cableways (Circular No. 455), and until August 17 for shop materials, pumps, jacks, repair parts for steam shovels and dumping cars, truck springs, chains, twist drills, teamers, taps, milling cutters, drill chucks, saw blades, carborundum wheels, etc. (Circular No. 457.)

An American consul in South Africa reports that the government railroads invite bids for 125 freight cars. The consul has forwarded plans and specifications referring to a previous order for 50 cars, which are identical with the 125 now wanted. These specifications and the name of the official to whom the bids should be sent can be obtained from the Bureau of Manufactures, Washington, D. C. (Inquiry No. 2,490.)

TRADE PUBLICATIONS.

Car Movers.—A leaflet issued by the Walter A. Zelnicker Supply Co., St. Louis, Mo., describes the double clutch car mover.

Instruction Pamphlet.—The Westinghouse Traction Brake Co., Pittsburgh, Pa., has issued an instruction pamphlet, No. T 5,037, for the guidance of those using the No. 12 E L locomotive brake equipment.

Expanded Metal.—A small pamphlet of the Northwestern

Expanded Metal Co., Chicago, contains a large amount of valuable information for the use of those interested in reinforced concrete building construction.

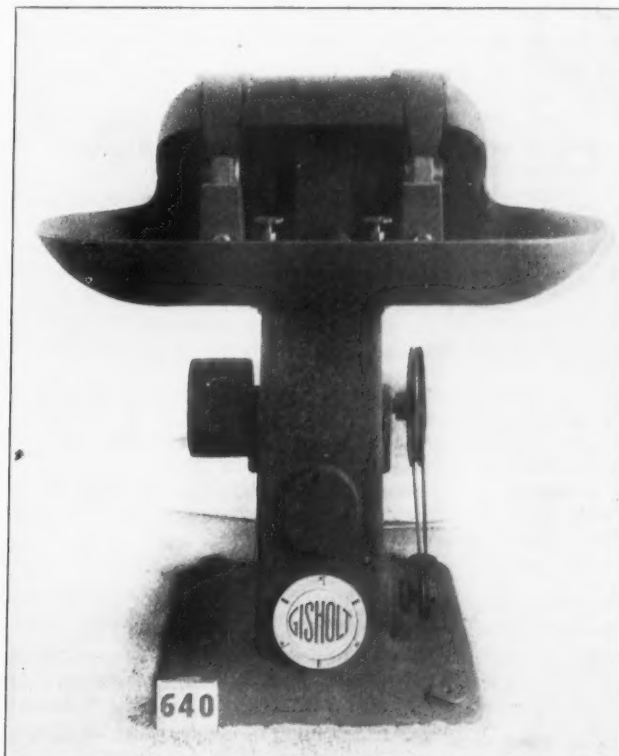
The Northern Engineering Works, Detroit, Mich., has issued a vest-pocket size booklet, describing and illustrating, mainly with half-tone cuts, many designs of its electric traveling and hand-power cranes and electric hoists.

Power Presses.—A neat illustrated catalogue issued by Zeh & Hahnemann Co., Newark, N. J., describes a number of power presses, including the inclinable, horn, punching, wedge adjustment, straight sided presses and others.

Train Heating.—Tate, Jones & Co., Inc., Pittsburgh, Pa., have issued in pamphlet form an article entitled "Train Heating on Electric Divisions of Steam Railroads," being a reprint of the article published in the *Railroad Gazette*, March 13, 1908.

Gisholt Double Emery Grinder.

A double emery grinder, a new machine of the Gisholt Machine Co., Madison, Wis., is shown in the accompanying engraving. It is enclosed as much as is possible with a grinder of this type, and is provided with a fan water pump and large water reservoir, insuring an abundant supply of water. The



Gisholt Emery Grinder.

water nozzle, instead of being in the usual position on the upper side of the work rest, is on the back or wheel side of the rest. The water therefore follows the wheel and comes around in a fine spray, meeting work and wheel at point of contact; thus the work is always in plain view. This method of water supply does away very largely with splashing and is a material assistance in keeping the floor dry about the machine. In addition to this, the machine has a large water pan, so flared on the sides and front that a piece of work up to 14 in. long comes entirely within the pan, which catches all drip and drains it into the tank.

The machine has two 1½-in. face by 14-in. diameter emery wheels, mounted on a spindle running in adjustable self-oiling boxes. Any end play in the spindle may be easily and effectually taken up by adjusting two screws in the face of the spindle-driving pulley. The machine is either belt or motor-driven. The spindle pulley is so protected that the belt is

kept entirely shielded from water and emery, prolonging its life. The machine is very heavy and was originally designed by the company for its own use. The manner in which the emery wheels are enclosed reduces to a minimum the emery dust that is likely to fly from a machine of this type; and the provision for keeping the floor dry about the machine is a good feature.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

M. D. Royer has been appointed Auditor of the Illinois Northern, the Chicago, West Pullman & Southern, the Calumet & Southeastern, the Deering Southwestern, the Lagonda Western and the Owasco River railroads, succeeding W. W. Vincent, resigned.

Operating Officers.

F. A. Parker has been appointed Chief Despatcher and Division Operator of the Missouri division of the Chicago, Rock Island & Pacific, with office at Trenton, Mo., succeeding J. P. Quigley, resigned.

D. I. Roberts, Canadian Freight and Passenger Agent of the Delaware & Hudson, with office at Montreal, Que., has been appointed also General Manager of the Quebec, Montreal & Southern, succeeding C. B. Hibbard, resigned.

J. R. Dillon, Superintendent of the Houston Belt & Terminal, has been appointed Second Vice-President and General Manager of the Gulf & Interstate. F. H. Dever, General Manager of the Gulf & Interstate, will succeed Mr. Dillon as Superintendent of the Houston Belt & Terminal.

F. N. Crowell, the recently appointed Engineer of Maintenance of Way of the Richmond division of the Pennsylvania Lines West, was born at South Orange, N. J. After graduating in 1896 from Rutgers College, he worked as draftsman in the mechanical engineering department of the New York & Brooklyn Bridge Co. until June, 1897, when he began railroad work on the Pennsylvania Lines West as assistant on the Engineering Corps of the Pittsburgh division. By 1902 he had become Assistant Engineer of Maintenance of Way of the Logansport division. From 1904 to 1906 he was Assistant Engineer of Maintenance of Way, first of the Eastern division and then of the Pittsburgh division. In September, 1906, he was promoted to Engineer of Maintenance of Way of the Marietta division, which position he held until his appointment on the Richmond division.

Traffic Officers.

Day Cage has been appointed to the new office of General Live Stock Agent of the Stephenville, North & South Texas.

J. W. Allison has been appointed Assistant General Freight Agent of the Cincinnati, Hamilton & Dayton, succeeding A. D. McLeod, deceased.

H. A. Bonn has been appointed Northwestern Passenger Agent of the New York, Chicago & St. Louis, with headquarters at Seattle, Wash., effective September 1.

H. T. Safford, Traveling Passenger Agent of the Chesapeake & Ohio at New York, has been appointed Manager of Marster's Tourist Agency, with offices in New York and Boston, Mass.

T. J. Wall is Traveling Passenger Agent of the Canadian Pacific at St. Louis, Mo. It was erroneously stated in our issue of last week that E. Olson had been appointed to this position.

Charles J. Payton, rate clerk in the freight department of the St. Louis, Brownsville & Mexico at Kingsville, Tex., has been appointed Commercial Agent at Houston, succeeding J. A. Giraud, resigned.

Engineering and Rolling Stock Officers.

Sherman Smith has been appointed Superintendent of Construction of the Grand Trunk Pacific at Portage la Prairie, Man., succeeding Otis Weeks, resigned.

D. B. Bartholomew, Assistant Supervisor of Signals of the

Pennsylvania at Kittanning, has been transferred, as Assistant Supervisor of Signals, to the West Jersey & Seashore, with office at Camden, N. J.

E. S. Heyser, Roadmaster of the St. Louis, Brownsville & Mexico at Bay City, Tex., has been transferred, as Roadmaster, to Refugio, Tex., succeeding W. J. Carnohan, granted leave of absence. T. P. Vuncannon succeeds Mr. Heyser.

E. F. McCrea, Assistant Engineer of Maintenance of Way of the Pennsylvania Lines West at Cleveland, Ohio, has been appointed Assistant Engineer of Maintenance of Way, Pittsburgh, Pa., succeeding S. W. Hodgkin, transferred. G. R. Barry, Assistant Engineer at Columbus, Ohio, succeeds Mr. McCrea. R. C. Miller, Assistant Engineer at Logansport, Ind., succeeds Mr. Barry. H. W. Brown, Assistant Engineer at Louisville, Ky., succeeds Mr. Miller, and Mr. Nesbit, heretofore of the engineering corps, of the Eastern division, with headquarters at Allegheny, succeeds Mr. Brown.

OBITUARY.

Thomas J. Gargan, a member of the Boston Transit Commission, died in Berlin on July 31. He was about 64 years old and for several years had been engaged in public affairs in Massachusetts.

Railroad Construction.

New Incorporations, Surveys, Etc.

ATLANTA & ST. ANDREW'S BAY.—President A. B. Steele is quoted as confirming the report of the completion of the line to Panama City, Fla., and says further that it is expected that through schedules will be instituted at an early date. (R. R. G., May 8, p. 564.)

BEAUMONT & GREAT NORTHERN.—The Texas Railroad Commission has given this road permission to cross the Houston, East & West Texas at Livingston, Tex., at grade. (June 19, p. 208.)

BURLINGTON INTERURBAN.—Incorporated in Colorado, with \$2,500,000 capital and principal office in Denver. Incorporators are: R. C. Watson, F. O. Olsan, J. P. Klug, F. K. Hatch, C. I. Moore, C. A. Fletcher and M. L. Chapman. The company proposes to operate electric cars in the counties of Denver, Adams, Larimer and Wells, with terminals at Denver and Ft. Collins.

CANADIAN NORTHERN.—Pease Bros., Port Arthur, Ont., have a large contract for betterment work near Wabigoon, Ont. See Edmonton, Yukon & Pacific.

CANADIAN PACIFIC.—This company will spend \$29,000 on yard improvements at Portage la Prairie, Man.

CAROLINA, CLINCHFIELD & OHIO.—This company is said to have let a contract to the Asheville Fuel & Dray Co. for grading on the line near Glenwood, N. C. R. M. Ramsey, of Asheville, is President of the contracting firm. (R. R. G., May 15, p. 687.)

CENTRAL WISCONSIN TRANSIT.—This company has applied for a charter in Wisconsin to build a steam or electric railroad from Kilbourn, Wis., north through Adams county to Grand Rapids, about 65 miles. Capital stock is said to be \$25,000. The headquarters of the road will be at Kilbourn, and the incorporators and first board of directors are: J. J. Burns and C. F. Burns, Chicago; C. H. Campbell, R. Wintermute and W. Sweet, Kilbourn. Burns & Co., Chicago, are in charge of construction work.

CHICAGO, MILWAUKEE & ST. PAUL.—A Butte, Mont., press report says that the last spike was driven on the extension between Chicago and Butte on July 27, and that through passenger trains from Chicago will be run into Butte not later than September 1. (July 31, p. 647.)

COLGATE, SULPHUR & WESTERN.—It is said that work on this line will begin at once at Sulphur, Okla. The proposed route is from Sulphur, southwest to Davis, thence northwest, via Wynnewood, Pauls Valley and Lexington, to Oklahoma City, about 75 miles. A. C. Frost, President, Milwaukee, Wis.

DENVER, LARAMIE & NORTHWESTERN.—A contract has been let to the Continental Tie & Lumber Co., of Houston, Tex., for 120,000 cross-ties, a number sufficient for 70 miles of the new line projected from Denver, Colo., through Fort Collins and Granger, Wyo., to Seattle, Wash. The headquarters of the company are in the Ernest & Cranmer building, Denver, Colo.

EDMONTON, YUKON & PACIFIC.—The government has guaranteed bonds of this company, which is a subsidiary of the Canadian Northern, at the rate of \$14,000 a mile for the first 150 miles westerly from Edmonton, Alb., and \$25,000 a mile for the next 50 miles.

GALATIA, HARRISBURG & SOUTHEASTERN.—This company has been incorporated in Springfield, Ill., with a capital stock of \$50,000 to build a line from Galatia, Ill., southwest to a point on the Ohio river in Hardin county. The incorporators are J. W. Shaw, J. B. Ford, J. E. Dorris, Jr., C. M. Warren, of Harrisburg, Ill., and A. J. Webber, of Galatia.

GRAND TRUNK.—The arrangement by which this line and the Temiskaming & Northern Ontario used the Canadian Pacific tracks for their entrance into North Bay, Ont., is about to expire. The Grand Trunk and the Temiskaming & Northern Ontario have, therefore, agreed to build a joint road from Nipissing Junction into North Bay.

GULF, COLORADO & SANTA FE.—An officer is said to have confirmed the report that the Beaumont division will be reblasted from Rayburn, Tex., east 16 miles, by the company's forces.

INTERCOLONIAL.—The Dominion Government has voted \$400,000 for the relocation of the line from Georges River, Nova Scotia, to Sydney Mines by way of Little Bras d'Or. From Sydney Mines to North Sydney the existing line will remain, but from North Sydney to Leitch's Creek the road will be relocated by way of Upper North Sydney.

A bridge over Hall's Creek on the line between Moncton, N. B., and Painsec Junction has been completed and the reduction of grade and double-tracking is being continued rapidly. (R. R. G., March 13, p. 396.)

KANSAS CITY, MEXICO & ORIENT.—The Texas Railroad Commission has given this line permission to cross the tracks of the Ft. Worth & Denver City, at Chillicothe, Tex., at grade. The citizens of Chillicothe, it is said, donated some 12 miles of right of way. The original route was changed to cross the river so as to go through that town. The actual mileage of the new route is about the same as that of the old one. (See Chihuahua, Mex., under Railroad Structures.)

KANSAS CITY, OZARKS & SOUTHERN.—It is said that the work on the new line between Mansfield, Mo., and Ava is being rushed, and it is fully expected that cars will be operated over the road not later than October. The building of this railroad, it is said, will open up about 1,400 square miles of territory which is now without railroad facilities. (June 19, p. 209.)

KANSAS-COLORADO.—Contracts for the construction of the La Junta and Kansas divisions of this road, including grading, ties and steel bridges, have been awarded to A. B. Hulit, representing the Northern Electrical Company. Work will begin within 90 days.

KIOWA, HARDTNER & PACIFIC.—Incorporated in Kansas with a capital stock of \$100,000 to build a steam road from Kiowa, Kan., west to Trinidad, Colo., about 325 miles, through the counties of Barber, Kan., Comanche, Clark, Meade, Seward, Stevens and Morton and Bacon, Colorado, and Las Animas. The incorporators are: I. B. Blackstock, Springfield, Ill.; W. H. Brownback, Edenburg, Ill.; J. H. Morgan, Capron, Okla.; J. H. Decker, Eldred, Kans.; Jacob Achenbach, A. B. Jarvis, J. W. Blunk and W. J. Sterlong, all of Hardtner, Kans. The main offices of the company are at Hardtner.

MEMPHIS & CHATTANOOGA.—See Southern.

NASHVILLE & HUNTSVILLE (ELECTRIC).—It is said that ground has been broken one mile west of Huntsville, Ala., on this line. J. E. Toney is said to have a contract for one section. (June 12, p. 95.)

NEVADA-CALIFORNIA-OREGON.—A press report from Reno, Nev.,

says that the road will be completed from Reno, Nev., north to Alturas, Cal., by October 15, 1908. (R. R. G., March 15, p. 387.)

NEW YORK SUBWAYS.—The New York Public Service Commission, First district, has been informed that the Interborough Rapid Transit will begin work on building the crossover between the Ninety-sixth street and the One Hundred and Third street station on the Broadway branch of the subway in the early part of August. The work, it is said, will take from 18 months to two years. The installation of the crossover is expected to increase greatly the capacity of the subway. The improvement was one of the conditions imposed upon the Interborough before the Commission would approve the \$55,000,000 mortgage made by the company several months ago.

Henry B. Seaman, Chief Engineer of the Commission, is quoted as saying that the proposed change in the route of the Broadway-Lexington avenue subway would save the city more than \$200,000. The contemplated alterations provide for a four-track instead of two-track tunnel under the Harlem river, and the changing of the route in the Bronx from Park avenue to Mott avenue, which would allow the building of an elevated line about a mile long. (R. R. G., Jan. 17, p. 105.)

OIL BELT TRACTION.—This line being surveyed from Charleston, Ill., south to Mount Carmel, 90 miles. It is said that the road will be operated by gasoline motor cars.

PAN-AMERICAN.—J. M. Neeland, Vice-President and General Manager, is quoted as saying that construction will be commenced on the Guatemala division as soon as the present rainy season is over. The concession for the extension of the road from the Mexican-Guatemala border to a connection with the Guatemala Railroad was, it is said, obtained by Mr. Neeland from the Guatemala government several months ago. Only about 40 miles of track have to be built in order to fill this gap. Regular passenger trains are being run over the Pan-American from its connection with the Tehuantepec National to Tapachula, Chippas, which is within 25 miles of the Guatemalan border. (June 21, p. 917.)

PENNSYLVANIA.—Chief Engineer A. C. Shand writes that the only piece of two-track line between New York and Pittsburgh is in Greensburg, Pa., running from what is known as Southwest Junction to Radebaugh, about 1½ miles. The company has been considering for some time a change in the grade at this point and the completion of the four-track system. This necessitates making a cut to take the place of about 800 ft. of tunnel and building an overhead bridge where the new grade will cross Main street. The object in this change is to reduce the westbound grade from 1 per cent. to 0.6 per cent. The estimate of the cost for the entire work is about \$650,000. Although not yet authorized, it may be during the coming year.

PITTSBURGH, BINGHAMTON & EASTERN.—The contract for building this line from Pittsburgh, Pa., northeast to Binghamton, N. Y., 310 miles, has been awarded to William J. Oliver, Knoxville, Tenn. The contract price is \$13,000,000. Work will begin immediately on the section from Canton, Pa., to the Orange Hill coal fields, 33 miles. (R. R. G., Sept. 6, 1907, p. 278.)

ST. LOUIS, BARTLESVILLE & PACIFIC.—It has been officially announced that during the past week the contract for the construction of this road has been arranged and that work will begin September 15 on the line between Joplin, Mo., and Bartlesville, Okla. The entire survey covers a distance of about 300 miles.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—Contracts for \$250,000 worth of ballasting have been let to L. J. Smith, of Kansas City, Mo. The work includes ballasting the Valley division from McGehee, Ark., to Riverton, La., 118 miles, and the El Dorado and Bastrop division from El Dorado, Ark., to Felsenthal, 32 miles.

SALEM, FALLS CITY & WESTERN.—Construction work on this line from Dallas, Tex., to Salem, was commenced on July 28. L. Gerlinger, Portland, Ore., president of the road, has announced that the work will be carried on as rapidly as possible so that the extension may be completed by October, 1909.

SALT LAKE & OGDEN.—President Bamberger is quoted as saying that he expects to have passenger trains running on regular schedule between Salt Lake City, Utah, and Ogden, by August 1; also that it is the intention to use electric power on the entire road as soon as possible. (R. R. G., March 13, p. 394.)

SOUTHERN.—The tunnel through Lookout mountain, on the Memphis & Chattanooga, is said to have been completed. (R. R. G., March 13, p. 394.)

SOUTHERN PACIFIC.—On the new Cananea, Yaqui River & Pacific branch, which is building from Nogales, Sonora, to Del Rio, grading parties are within about four miles of Del Rio. At Del Rio the branch will connect with an existing line which runs from Cananea to Naco, Ariz. It is said that trains will be run from Nogales to Naco by September.

TEMISKAMING & NORTHERN ONTARIO.—See Grand Trunk.

TEXAS ROADS.—W. J. Newcom, of Terrell, Tex., is said to be promoting plans for a railroad from Ennis northeast to Waco, about 65 miles.

It is said that the Quanah & Southwestern Construction Co. proposes to build a standard gage railroad from Quanah, Tex., southwest to Paducah, about 55 miles.

Railroad Financial News.

BOSTON & MAINE.—This company has filed a demurrer in the United States District Court in answer to the bill in equity brought against it by the Federal government on the ground that its control had illegally passed to the New York, New Haven & Hartford. The demurrer asks that the case be dismissed because the government bill is vague and obscure.

CHICAGO GREAT WESTERN.—It is said that in the reorganization of this road as planned by the English Committee, representing the debenture stockholders, that the preferred "B" and common stock will be merged into one class of stock. One hundred shares of preferred "B" will be considered equal to 290 shares of common. There has been deposited with the committee a majority of the debenture \$28,127,085 stock and script outstanding, and the debenture stockholders and holders of the preferred "A" stock control the situation in the reorganization plan.

DENVER & RIO GRANDE.—On August 1, 1908, the old Denver & Rio Grande and the Rio Grande Western ceased to exist, and the new Denver & Rio Grande took over operation. (July 31, p. 648.)

DETROIT, TOLEDO & IRONTON.—The Ramsey Committee, representing the 5 per cent. collateral trust note holders, has extended the time for depositing these notes to August 10.

ERIE.—J. P. Morgan & Co. bought, on July 31, the coupons falling due August 1, 1908, on the collateral 4 per cent. bonds of 1901-1951. (June 19, 1908, p. 210.)

GREAT NORTHERN.—See Vancouver, Westminster & Yukon.

HONDURAS RAILROAD.—This road, which has been owned by the government, is, it is said, to be leased to a New York syndicate. The lessee agrees to make extensions and improvements. The line is 54 miles long, running from Puerto Cortes to San Pedro, and it is the only railroad in Honduras.

MANHATTAN (ELEVATED) RAILWAY.—Redmond & Co., Moffat & White and N. W. Harris & Co., all of New York, are offering \$4,500,000 consolidated (now first) mortgage bonds of 1890-1990 at 96½.

MICHIGAN UNITED RAILWAY.—The first and refunding mortgage bonds, of which \$1,000,000 were recently offered in London, are subject to outstanding prior issues of bonds aggregating \$2,750,000. Enough first and refunding bonds are to be reserved to be exchanged for these outstanding bonds at par, and, it is said, \$350,000 outstanding bonds have already been so exchanged.

MOHAWK VALLEY.—This holding company for the New York Central-Andrews Syndicate's electric lines in New York state has reduced its capital stock from \$20,000,000 to \$7,500,000.

The amount involved in the reduction is to be distributed among the shareholders. The capital stock of the Rochester & Eastern Rapid Railway, formerly a subsidiary of the Mohawk Valley Co., has at the same time been increased from \$1,500,000 to \$15,290,200. This means that the Rochester & Eastern has taken over the capital stock of both the Utica & Mohawk and the Oneida Railway and a majority of the stock of the Syracuse Rapid Transit. The Rochester & Eastern is controlled by the New York Central & Hudson River, but its stock is owned by a syndicate.

NEW YORK CITY INTERBOROUGH RAILWAY.—This company, which operates electric roads in the Bronx, New York, recently made an application to change its name to the Bronx Crosstown Railway, so as to avoid confusion with the Interborough-Metropolitan and the Interborough Rapid Transit. The change of name was not permitted, because there is already a Bronx Traction Co., and also because the road is not strictly a crosstown line.

NEW YORK, NEW HAVEN & HARTFORD.—The Maine Steamship Company, nearly all of whose capital stock is owned by the New York, New Haven & Hartford, has defaulted in payment of interest due April 1, on its first lien 5 per cent. bonds. There are authorized \$1,000,000 of these bonds, of which the New York, New Haven & Hartford owns \$267,000. It is said that the company has easily earned the interest on these bonds, and no reason is given for the default. The bonds are secured by the stock of the Maine Steamship Company, of Maine.

PITTSBURGH & CASTLE SHANNON.—The Safe Deposit & Trust Co., Pittsburgh, Pa., is offering at par \$100,000 first mortgage 5 per cent. bonds, dated August 1, 1908, due in annual installments of \$10,000 each on August 1, from 1909 to 1923, inclusive, but omitting 1910 and each third year thereafter. The company is controlled by the Pittsburgh Coal Co., through ownership of 90 per cent. of its stock.

ROCHESTER & EASTERN RAPID RAILWAY.—See Mohawk Valley.

SEABOARD AIR LINE.—Sutro Brothers & Co., New York, are offering \$500,000 6 per cent. receiver's certificates of 1908-1911 at par.

SOUTHERN INDIANA.—The interest due August 1 on the first mortgage 4 per cent. bonds of 1901-1951 was not paid, but a statement, issued by the Assistant Treasurer, says that the company will be able to pay this interest within 90 days.

VANCOUVER, VICTORIA & EASTERN.—See Vancouver, Westminster & Yukon.

VANCOUVER, WESTMINSTER & YUKON.—All the property of this company has been turned over to the Vancouver, Victoria & Eastern, which is a subsidiary of the Great Northern. The property is worth in the neighborhood of \$2,500,000, most of which was advanced by Great Northern interests.

VIRGINIA PASSENGER & POWER Co.—This company, the Richmond Passenger & Power Co., the Richmond Traction Co., and controlled lines, in all operating about 119 miles of line in and around Richmond, Va., are to be reorganized by a committee composed of Douglas Robinson, Chairman; Frank J. Gould, Charles Whelen, Percy N. Chandler, R. Lancaster Williams, Fritz Sitterding and John D. Dickerson, Jr., Secretary. Holders of the various securities of these companies are asked to deposit them with the Bowling Green Trust Co. It is said that the proposed plan of reorganization provides for a new company with \$7,500,000 common stock and \$5,000,000 non-cumulative preferred stock and \$15,000,000 bonds.

WABASH-PITTSBURGH TERMINAL.—The first mortgage bondholders' committee have extended the time to August 25 for depositing bonds with the committee. D. Crawford Clark and Charles C. Jackson have been elected additional members of the bondholders' committee. (June 5, 1908, p. 47.)

WHEELING & LAKE ERIE.—Kuhn, Loeb & Co. and Blair & Co. have offered to buy \$8,000,000 Wheeling & Lake Erie 4 per cent. notes, due August 1, secured by \$12,000,000 Wheeling & Lake Erie general 4 per cent. bonds and guaranteed by the Wabash. It is said that in this way the obligation of the Wabash to pay these notes has been discharged.